Nature Magazine

VOLUME 35 NUMBER 8

OCTOBER 1942

35 CENTS

Pep Up Your Meetings

Motion pictures of Nature and the Outdoors will take you far and wide in the world of the wild.

Schools; Garden Clubs; Women's Clubs; Nature and Hiking Clubs; Boy and Girl Scout Troops; Church, Civic and Fraternal Organizations; Sportsman and Conservation Groups will be interested in these motion picture films. Thrilling, educational motion pictures help to boost attendance at meetings. They make meetings more interesting and help to promote some educational activities by increasing a knowledge of Nature and the outdoors; developing a consciousness of the need for practical conservation of our national resources and the protection of wildlife.

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For forty years William L. Finley has been shooting wildlife. But everything he has shot still lives for it was shot with a motion picture camera. More than two hundred thousand feet of film now carry the record of his camera hunting.

The American Nature Association commissioned Dr. Finley to edit eighteen 400-foot reels of 16 millimeter motion picture film, drawing upon the best of his material. Thus 200,000 feet of 35 millimeter film are condensed into the equivalent of 18,000 feet of the best shots of all.

These interesting, entertaining and educational films are grouped as follows:

GROUP I: Specially adapted for school use and for juvenile audiences.

11. *Babes in the Woods:* The life of Nature's young in the wild.
12. *Wild Animal Pets:* A naturalist's dog into whose life came many strange animals.
13. *Renting Houses for Songs:* An intimate study of bird life.

GROUP II: A spectacular series of Alaskan reels.

21. *Cruising North:* Murres, sea puffins, bear and other coastal wildlife.
22. *Off to Glacier Bay:* Spectacular pictures of the face of a glacier breaking off and plunging into the bay. Also wildlife scenes.
23. *Wild Animal Outposts:* Hardy Island deer, ptarmigan, bear cubs, blue fox, fur seals of the Pribilofs.
24. *Thar She Blows:* Whales at sea.
25. *Great Bear of Alaska:* Films of the great Kodiak bears of Admiralty Island.

GROUP III: Southwestern series.

31. *Wings to the South:* Bird life of the Texas Gulf coast and the southwest.
32. *Riding the Rimrock:* Searching the rough country of the southwest for its wildlife.
33. *Nature's Side Show:* The struggle for existence in the arid southwest.
34. *Queer Creatures of the Cactus Country:* A study in the adaptation of wildlife to a harsh land.
35. *Getting Personal with Mountain Lions:* A thrilling picture of a pack trip into lion country.

GROUP IV: Photographed along the Continental Divide.

41. *The Big Game Parade:* You meet Antelope, Mountain Sheep, Mule Deer, Elk, Bison, Moose, Brown Bears and Grizzlies.
42. *The Forests:* Forest Fires, Birds, Beaver—greatest conservationist of all—at work.
43. *When Mountains Call:* The life of the high places is thrilling to see. Water Ouzel, Ptarmigan, American Eagle, Big Horn Sheep, Wapiti—American cousin of the European Stag.
44. *Ramparts of the North:* Filming big game requires endurance. Glaciers, Hoary Marmot, Caribou, Moose, Black Bear.
45. *Getting Our Goat:* Mountain Goat on its native crags. Ground Squirrels, Cony, Grouse.

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The Association will pay expressage or postage when films are shipped to customers. The customer will pay return mailing charges and will be responsible for films until returned to 1214 Sixteenth Street, N.W., Washington, D. C. Rentals will be shipped C. O. D. unless paid for in advance.

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So, again, and in still another way, Bausch & Lomb gives aid to America's all-out for Victory. Its other contributions, more obvious, include gunfire control equipment—rangefinders, binoculars, aerial height finders. Behind the scenes, but of no less importance, are the instruments of industrial research and production—metallographic equipment, spectrographs, toolmakers' microscopes, contour-measuring projectors. Bausch & Lomb eyewear products — eye examination instruments, spectacle lenses and frames—keep a nation of workers at top visual efficiency.

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Camera Trails

BY NORRIS W. HARKNESS

The Autumn Season

October and November are two of the year's best months for photographers. You have harvest pictures, the most brilliant color pictures, timely Hallowe'en and Thanksgiving shots—pictures all around the Nature photographer. The autumn season demands the continuation of the year-round series of your favorite spot in the garden, and the darkroom is now cool enough to encourage the printing of the summer's negatives while the time for making the Christmas cards is getting shorter. All together there is plenty for the photographer to do, and many of his immediate opportunities will not wait.

It may seem a bit silly to start worrying about Christmas cards in the first week in October, but if you tell yourself that you have more than enough time for them, you will probably find yourself rushing to finish them just in time to be too late. I have talked about making them before and will not again this year unless you want such a story, but one thing should be remembered for Christmas, 1942. It is a more serious year than any we have known and demands more serious treatment of so serious a subject. This is not the year for the funny Christmas card, and the cards that will be best received by your friends will reflect a deeper feeling than might have been used a few years ago. Snow scenes, religious subjects and pictures of the family will find more favorable attention in the minds of those who get them. And get your paper and envelopes early. There is no general shortage of either of those items, but special orders take longer than they once did, and, if you wait too long, you may find that you cannot get just what you want.

The all-year series of pictures of that one best garden scene will show a greater difference between September and November than in the same interval at any other time of year with the exception, perhaps, of the early spring. The same black and white or color film should be used, of course, as in the rest of the series, and the same camera position and lighting angle will show the effect of the season more effectively than too many variations in the elements of the picture. But the colors in the scene and the lower sun will make this a splendid time to follow the plan of making shots every hour all day from sunrise to sunset with the camera in the same position. The only difference between the shots will be in the shutter speed that varies with the intensity and direction of the light. From the series you will learn much about the importance of the angle of the light, but I have been into that fairly recently, too.

Fall and color are synonymous to the photographer who has tried either Kodachrome or Kodacolor. Both need a new kind of thinking for the black and white photographer who has been training himself to ignore the colors in his subjects and think of them in monochrome. You will need to consider not only the composition of the lines and masses in their proportion to each other and the picture area, but also pay attention to their color and the harmony between them and the feeling of the subject. Technically, flat lighting and careful use of your exposure meter, or the instruction sheet that comes with the film, will solve most of your problems, but you must beware of being carried away by the new medium and shooting color just because it is brilliant and striking. The less forceful tones and tints will often make better subjects, and the danger of harsh discord between strong colors that cannot safely be shown too close together will be decreased. Shoot carefully and save the brighter objects for accents that point off the whole picture.

Late harvest pictures are splendid in either monochrome or color but, since they are primarily story-telling in their appeal, you need to look at them from that viewpoint and avoid the merely pretty shots that have too little to say. In these days, the farm and its products, as part of the country's all-out war effort, are rich picture sources. So much of any picture lies in the mind of the beholder, rather than actually inside the borders of the print, that the idea you had when you made the exposure will show in it if you really thought it through before getting shutter-anxious. Maybe "shutter-anxious" is a good term for what is wrong with so many of the pictures we see everywhere. Make a note of it and see if you are being too eager to get it over, to get the shot on film before you have actually got the subject and viewpoint just as you want them.

Shots of burning leaves can be one of the finest pictorial subjects, but they, like the harvest scenes, need thoughtful treatment and careful choice of the camera position. Try a location that gives backlighting with the wind carrying the smoke in a fairly well-defined path across the line of the lens. Be sure, of course, that the direct light does not hit the lens but have it quite strong on the back of your living subject, who must be doing something that looks real and active and not like a picture pose. Keep the camera out of the smoke, which will make the image much less sharp if there is a great depth of it between the camera and the important center of interest.

The holiday pictures are naturally of the story-telling variety even though they will be pictorial if you keep both angles in mind as you arrange your subjects. Contrasty lighting and generous use of darkness will make the Hallowe'en shots more dramatic and spooky, but the Thanksgiving pictures need flatter lighting and a happier, more healthy approach. Do not miss the turkey as it comes from the oven and start soon enough to get it alive if possible. Try to get the feeling of the day into the faces you show, but remember that that feeling will not be in the pictures unless both the photographer and his subjects feel it when the shots are made.

All this has rambled over a lot of territory without being very helpful from the technical standpoint, but in a very real sense this is the New Year for the camera. The summer's shots are now on film and the new season for clubs, darkroom work, and greatest photographic activity is at hand. It is the time to think more of pictures and effective subject matter with less wandering in the technical realm. The finest technique and the most expert handling of chemicals will never make pictures, and the owner of the box camera who can see his picture and then arrange it in such a way as to get what he saw will make better and more attracting—rather than just attractive—results.

It is also the time to plan your camera work a little more than most amateurs usually do. That does not mean that you should plan the year's pictures now, even if you could, but it does call for more thorough canvassing of the details of the subject before you start shooting. Check more carefully on lighting and backgrounds and then make the exposure. Then develop the negatives in accordance with your standard routine and make the best prints you can. It is the way to get the pictures you have wanted.

The Question Corner

C. L. R., Winnipeg, Canada, asks: "Can a negative be hardened too much or will additional hardness of the emulsion simply make the film less liable to mechanical damage?"

ANS.—Too much hardening is definitely bad. The emulsion that has been over-hardened will be more likely to hold water on its surface in drying and therefore have water marks, and after it is thoroughly dry—in a year or two—the emulsion is likely to chip off the celluloid base. Some of the negatives I hardened in formalin five or six years ago now peel off the base or snap off when the film is bent slightly. They are ruined completely. The minimum hardening that will keep the emulsion intact until it is dry is best.

M. K., Easton, Penna., asks: "Is it possible to get permission to make pictures in Army camps?"

ANS.—The authority to grant such permission lies with the commandant of the post and is generally issued through the public relations officer at the camp. Always see him before using your camera in or around military or naval posts. For some reason he may not be able to allow you to make pictures, but if you follow his orders, you will keep out of trouble.

G. J., Dallas, Texas, sends several prints and asks: "Why are all my prints so flat and gray? I develop my negatives in accordance with the directions and try to obey instructions, but they are all like these."

ANS.—Either the paper is too soft for the negatives, or the negatives need more development, or the development of the prints is not carried far enough. I could tell more if you sent the negatives. Try a harder paper—perhaps number 4 instead of number 2 or 3—and develop the prints for a full minute in the standard developer. If the number 4 paper is better, it is an indication that the negatives need more development, which may be obtained by longer development, greater agitation, higher temperature, or a combination of all these factors. Experiment with the development of the negatives until the average scene will reproduce best on the normal or number 2 paper when the print is fully developed and properly exposed.

H. L. D., Lexington, Kentucky, says: "I have a great deal of trouble with my flash outfit. Some of the shots are properly synchronized and others are completely out. What might be wrong and how can I check?"

ANS.—First test all electrical connections, moving the wires as you do so to see that neither wires nor insulation is broken. Then with new batteries in the case, put a piece of regular enlarging paper in the film holder of the camera—just placing it on the film guides of the roll film camera will do—and make a picture of yourself and the bulb in a mirror. With my Press 25 bulbs and Number 2 Kodabromide I use f/22 at 1/100th second with the lens 3 feet from the mirror. If the bulb appears evenly black when the paper is developed—a negative image, of course—the synchronization is all right. If the bottom of the bulb is black and the top still light, it means that the bulb went off a little too late, and if it went off too soon, the lower part will be a little lighter than the top. The most frequent cause of irregular results is stale or exhausted batteries.

This and That

By the time this reaches you, the details of the Red Cross contest for amateur photographers will have been announced, although at the moment of writing they are still uncertain. The purpose of the nation-wide contest is to illustrate the work of the Red Cross and the spirit behind the organization, and every photographer in the country is eligible to compete for the monthly and final grand awards. You will have to check with your local unit to get the accurate facts, but this is the tentative outline. Monthly prizes will be given for entries in October, November, and December, and the final grand awards will be made from among the monthly winners in January, 1943. Go to your own Red Cross organization now to get the full story—but get started at once. The contest will benefit the Red Cross in publicizing its tremendous variety of activities; benefit the community and the country by increasing interest and understanding of one of its finest organizations; benefit the photographer by giving him new picture subjects and new excitement in his picture making whether he wins a war bond or not. The national headquarters for the contest is American Red Cross Contest, 598 Madison Avenue, New York City.

Another worthwhile war activity for all of us is the Pictures-From-Home plan mentioned in the August-September Camera Trails. To participate in the plan, you need only get in touch with the family of some service man and explain that you want to utilize your camera to help them and their man in uniform by making pictures of them and their home that they can mail to him wherever he is. Make the pictures of the people and things you and they know he would like to see now and make up prints small enough to fit an ordinary envelope. Give them the pictures and let them mail them in their next letters. Let them pay for the materials if that is necessary, or they prefer it that way, but consider the materials, skill and work part of your contribution to the war effort. Pictures from home mean even more than you think to the boys so far from home. Make them today; the boys want those pictures.

The manufacture of equipment is being reduced more and more, but the chances are that there will continue to be plenty of materials for any ordinary amateur work. Certain films are being withdrawn from the market and some surfaces and sizes of enlarging paper are hard to get, but the supply will not be reduced so far that you cannot continue your photography. It is imperative, however, that you conserve materials. That calls for careful thought before making exposures, and accurate, systematic darkroom methods with test strips for each new negative you print. In other words, use some thought with each bit of material to get the best possible results from the minimum amount of both paper and film. Save film spools and filmpack containers, as well as all other metal cans, and hand them to your camera store to be sent back to the factories that need them.

Raygram Corp., 425 Fourth Avenue, New York, has announced new plastic hangers for the processing of cut film and film packs. I have been using them for 4 x 5 cut film and like them very much. They are strong and light and are quicker to load than the metal ones. Full information on these and other Raygram products may be obtained by writing the above company mentioning Camera Trails.

The Camera, the Philadelphia magazine that has been the pictorialists' standard for so many years, is conducting a nation-wide contest for prints not larger than 8 x 10 with war bond prizes each month. Full details may be obtained from *The Camera,* Contest Editor, 153 North Seventh Street, Philadelphia, Penna.

The Miniature Camera Club of New York has started something that all other camera clubs could well copy. Working in cooperation with the USO and the War Activities Center in Pershing Square in New York, they have installed a small studio in the old Information Center opposite Grand Central Station and are making pictures of all men in the uniforms of the United Nations without cost either to the men or to those to whom the prints are sent. Furniture, backgrounds and lighting equipment were loaned by various dealers, and the cameras, materials, and work are donated by members of the club. Each soldier or sailor holds a numbered card to identify the negatives and before he leaves, he addresses the envelope in which the prints are mailed afterward.

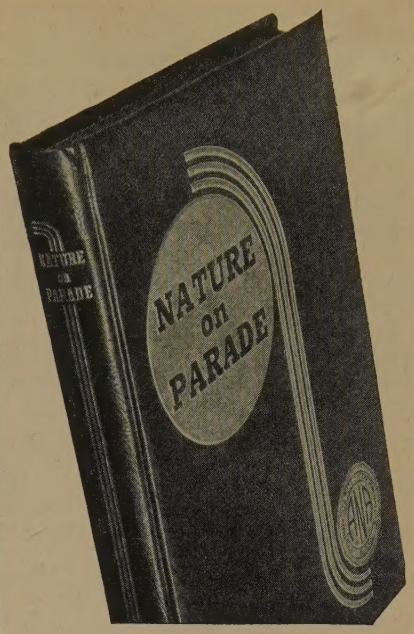
Collecting Clouds

It used to be believed in some quarters that one of the older camera clubs had a specialist who was sent out on the day before club outings to hang out the clouds. It sounds difficult from here, but collecting clouds is a good idea, whether you solve the problem of sticking them in the sky or not.

Such a collection might take several forms for several purposes. You might shoot any strong cloud formations with the thought of printing them into pictures that are otherwise satisfying but lack interest in the sky area. They will often make effective pictures by themselves, and that side of cloud collection should not be ignored.

But the gathering of clouds more scientifically is at once more interesting and more valuable, and a set of pictures showing all the main types of cloud formations with, perhaps, an accompanying story for each one telling what kind of weather its presence in

(Continued on page 443)



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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

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TO THE EDITOR

More on Bird Visits

Dear Sir:

In reference to wren feeding-counts, with which Mr. Roeseler's letter deals in your June-July issue, I submit the following information for any interest it may possibly contain.

On July 27 my mother made an accurate count, on paper, of the trips made by a pair of wrens to the house just outside the kitchen window. From 9-10 a.m., the pair came 58 times with food for the young ones. This count was made following a quiet shower. Next day the baby wrens left home, but we missed out on the number of "launchings".

Prior to her family responsibilities, Jenny Wren displayed an oddly feminine trait. One very hot morning, for no apparent reason, she furiously started housecleaning. First she brought all the soft little chicken feathers which drifted idly all around. Next she dragged out sticks, big and little.

The following morning, to our dismay, we found a screw holding the floor of her house had worn out, dumping the whole nest down on the ground! After it had been repaired securely, our undaunted wren began picking up the sticks from the ground below, once more refilling the house. All this while there was only one wren in evidence.

Obviously even in the bird-world there are plenty of headaches in the building trade—without benefit of priorities!

EMILIE G. SKIDMORE

Pleasant Valley, N. Y.

Wants to Correspond

Dear Sir:

I have enjoyed your magazine for a number of years and I assure you I consider it to be one of the most worthwhile publications. Will you kindly list my name as one wishing to correspond with other lovers of Nature? I am interested in all phases of Nature lore. Although I am familiar only with the Pacific Northwest, I would enjoy corresponding with anyone in this vast country of ours.

ELOUISE C. WELLS

Box 406
Orofino, Idaho.

We Thank You

Dear Sir:

Every edition of NATURE MAGAZINE is always awaited eagerly, used over and over and carefully saved. "Just what it is I cannot tell, because I love it all so well" . . . Please let me thank you for the great pleasure I have received, and remember I am only one of many eager readers.

CLARA M. EVERETT

Lowell, Mass.

CORRESPOND?

MR. Harold White, 328 San Mateo Dr., San Mateo, Calif. would like to correspond with others interested in botany, particularly taxology and economic botany.

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WAR CALLS COME FIRST

BELL TELEPHONE SYSTEM

Contents Noted

Feeling our way home in the early hours of a recent morning in the stygian throes of an all-night blackout, we fumbled at our key ring. Locker keys, office keys, automobile keys and one or two whose purpose is slightly obscure, were a jumble. We realized the deficiency of our tactile sense more acutely than ever before. In the midst of this growing futility a firefly flashed its bulb beside us, giving forth, in the blackness, an amazing light, momentary but enough to reveal the proper key. We had always wondered why Nature devised fireflies; now we know that she anticipates everything.

It is no military secret that government scientists schooled in the habits and appetites of insects have been mobilized to throw a protective cordon around our future guayule crop. Some seventy-five thousand acres of this rubber-bearing plant are to be planted. If these acres are going to make any contribution to our future supply of tires, hot water bottles, rubber heels and golf balls, the plants cannot serve as insect fodder. Scouts have found that a small bark beetle has a predilection for stacked guayule in Mexico, and can hang around and raise its progeny in the dry material for more than a year, damaging plants awaiting conversion. A special quarantine may be necessary to keep the beetle south of the border. The scientists also have the dossiers of other insects that gobble up plants similar to guayule and that might transfer their affections to Nature's gift to the Rubber Division of WPB. These include white grubs that do underground work on roots; dryland species of wireworms and millipeds; leaf-eating caterpillars, beetles and grasshoppers; aphids, leaf-hoppers, mealybugs, mites and scale insects. Life is indeed complicated.

As anyone who has read the pages of this magazine well knows, our enthusiasm for the rural billboard can definitely be described as restrained. We confess to a certain glee in the fact that the graph of automobile travel over country highways is in a power dive that will make the bucolic billboard more of a waste of paint, paper, lumber, sheet tin and money than before. Our sentiments about the treatment to which our rural landscapes have been subjected appear shared by the National Council of State Garden Clubs, which unanimously adopted a resolution pointing out that our scenic beauty should be "protected from destruction or disfigurement", that "property values are greatly depreciated by billboards and unsightly roadside structures", and that "highway safety calls for the removal of billboards" plus proper control of all other roadside uses. The resolution concludes with an endorsement of highway zoning. We are further heartened by figures compiled by the North Carolina Highway and Public Works Commission and which this body interprets as definitely proving that highway safety is enhanced by set back of billboards. Fatalities declined sharply after the moving of the signs.

That enemy submarines preying on our coastal shipping are getting information on sailings is unquestioned. Also there is a good indication that they may have secret fueling bases on the coast or adjacent islands. In fact, there is unpublicized evidence that some Nazis have come ashore to take in a movie and get a good American meal. As an aid to the solution of this problem, Jack Danciger of Fort Worth, Texas, comes forward with what strikes us as a mighty intelligent suggestion. Sportsmen and professional guides are particularly well acquainted with out-of-the-way places where the fish bite and ducks raft, Mr. Danciger points out. He proposes mobilizing them for a systematic search for possible points of rendezvous and other subversion. The large number of non-hunters who like to get into unspoiled places outdoors should also not be overlooked.

All over the country there are groups of organized hikers. They have developed hundreds of miles of trails, some provided with shelters and other facilities for those who go in for distance. Many of these trails cross private lands by special arrangement with the owners. Now, however, that that primitive form of locomotion—the human legs—is coming into its own, thanks to rubber famine and gasoline rationing, many unorganized hikers are taking to the trails. Their knowledge of the ethics of the trail are often rudimentary, and their respect for private property too often sadly underdeveloped. To meet this challenge to hiking and the legion of well-behaved hikers, the outdoor clubs associated with The Appalachian Trail Conference are distributing a little folder entitled "A Message to Those Who Walk in the Woods." It is the Emily Post of outdoor good manners, and it is rather a shock to realize that such pointed advice is necessary.

"What Do You Know About Poison Ivy?" is the inquisitive title of a valuable little booklet published by the Massachusetts Horticultural Society, Boston, Massachusetts, and worth every bit of the twenty-five cents asked for it. Every year we are impressed with how little people seem to know about poison ivy and how little they seem to reckon with it. R. W. W.

"WHAT WAS THAT YOU SAID?"

This study of Teddy, the collie, in what appears to be a quizzical mood was made by Frank Clodfelter, North Carolina photographer now resident in Virginia.

NATURE MAGAZINE
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The demands of war and the ingenuity of men of invention and research have—

Rediscovered Wood

By EGON GLESINGER

EUROPEAN shortages of raw materials and Nazi war demands have forced the Germans to look on wood with new eyes. Instead of raw lumber and raw fuel, they now consider wood from the point of view of the chemist, the synthesist, and the industrial engineer. Their concern is not with how wood can be fashioned with the axe and saw, but what wood's constituent parts can be made to do, and how its natural virtues as building material and heat producer can be improved.

The author of this article is Secretary-General of the International Forest Products Committee, a man widely informed on the technical progress of wood uses. He has written here, as one of the series of natural resources articles prepared specially for Nature Magazine, a provocative, informative and inspiring story of the wealth inherent in the forest.

Exhaustive German survey of the various fields of wood utilization as a whole has brought the conviction—now proved in practice—that the world's forests comprise an ever-renewable and hence inexhaustible mine of the most versatile raw material available to modern industry and the use needs of civilization.

In America the abundance of raw materials of all sorts has for a long time overshadowed this new development. But like every true crisis in human history, the present emergency proves to be a time when long-incubating fundamental changes are brought to fruition and receive general recognition, determining thereafter for long periods the economic shape of things to come.

We in America are assisting in a raw materials revolution of far-reaching consequences. One of its most important and lasting features may well be the significance of American forests defined in terms of additional fighting power, now, and the reconstruction of the postwar world when the mad society of the Axis powers is destroyed.

Recent discoveries have demonstrated that forest products are capable of fulfilling five distinctly different technical functions. They can be made to supply modern building materials, meeting new architectural and engineering requirements; to provide paper and textile fibers; to give us high caloric fuels; to serve as fodder, food for human consumption, and alcohol of all types; to yield by-products of various kinds obtained by chemical extraction.

How revolutionary these developments are may be observed by a swift survey of traditional wood use.

When man discovered the mysterious secret of fire, burning wood warmed his cave. When he first ventured from such shelter he used trees to build his first house. With his first tools man shaped the trees into square timbers and boards. Much time has gone by since. Enormous, almost incredible, technical progress has been achieved. But even today by far the largest part of all the wood harvested yearly from the forests of the world continues to be burned in open fireplaces, or used as poles, square timbers, beams, and boards for structural purposes. Until quite recently, technical progress had added little to the ancient forms of wood utilization.

The sizes of boards and other structural timbers can never exceed the dimensions of the trees from which they happen to be cut. Their grain and other qualities are equally predetermined by Nature. Until recently lumber could not be adapted to its ultimate uses as easily as other materials. This fact was frequently used to argue that wood is no longer a modern building material. Yet the truth is that unassisted Nature can no longer compete with the results of technical science as applied to other materials.

Finally it was found that the returns from forestry were rather low. This was chiefly due to the fact that only a fraction of every forest consists of trees that have sufficient qualities to live up to modern technical standards. A substantial part of the yearly crop, the so-called "low-grade wood," remained as a burden on the hands of the forest owner or lumberman. He could only dispose of it at a loss, because the price for fuelwood that generated little useful heat scarcely covered the wages involved. The same situation prevailed with sawdust, trimmings, and other by-products of manufacturing operations, material amounting to as

ONE OF THE EARLIEST AND MOST TRADITIONAL USES OF WOOD

With fuelwood, shelter shared man's primitive application of the trees of the forest, and through the centuries these have been the major uses until new wealth was found in wood.

much as fifty percent of the wood contents of the logs. There was no commercial outlet for this "waste".

Frequently these losses, combined with a heavy tax burden, became so serious that the forest owner was compelled to look for compensation by cutting his trees at the highest possible rate and was left with insufficient funds for reforestation. This led to depletion of forest reserves in Europe as well as in America; aroused severe public criticism; inspired demands for government ownership or management of the forests in order to conserve this essential natural resource. Yet government ownership, conducted at a loss, is no solution when the root of the problem lies in the fact that the rich possibilities of forests had been practically untouched by the magic wand of modern scientific progress.

While these troubles accumulated, discoveries were made and gradually applied. They added new uses for forest products, and provided new methods for processing and shaping wood products. Looked upon merely as routine developments, they remained largely unnoticed by the general public. Even many of those connected with forest industries considered them rather as isolated performances and failed to recognize their fundamental significance.

America's greatest use of wood is still construction. But to make it a truly modern building material, the size and quality of lumber and other structural timber had to be given wider range. The first step in that direction was to combine several pieces of wood in order to obtain the desired dimensions and structural strength. This is done either through the use of small metal connectors, which hold structural timbers together at intersecting points so that the joints are as strong as the solid beams, or by glueing the timbers into new solid pieces. Pioneered in Germany, structural wood glues and connectors have been brought to final perfection in America. During this war they have found unprecedented use in cantonments, airplane hangars, factories, warehouses, and other massive structures rapidly erected as prefabricated buildings on a mass production basis.

The next step was the discovery of plywood. Instead of cutting a tree into boards and beams, the log is peeled into thin sheets that unroll like a carpet. These sheets are then cut into any size desired, so that a single "board" can be as much as forty feet wide. The thin plies are spread with glue and piled on top of each other like the layers of a sandwich, with the grain of each succeeding layer running crosswise to the grain of the ply above and below. Since the strength of a board runs with the grain, this makes the completed plywood as strong in one direction as it is in the other. The glue-spread plies are finally compressed under tremendous pressure into solid boards, of any thickness desired, depending on the number of plies that are used. Use of synthetic resin glues makes these plywood "boards" water and weatherproof.

Recently the U. S. Forest Products Laboratory has added a further significant discovery—compregnated wood. "Compregnated" is a coined word meaning "impregnated and compressed." Wood plies as thin as $\frac{1}{10}$ of an inch are covered with glue, which impregnates the wood cells. As a result, this wood can be used as a plastic; the layers can be so disposed, moulded and pressed as to obtain and preserve any desired shape. Under steam or hydraulic pressure, which combines wood and resins, compregnated

A FAR CRY FROM THE HUMBLE LOG HOME IS THIS WAR BUILDING

Wooden roof trusses replace vital metals in such construction as this. The trusses were framed and assembled in six working days after the final lumber was received.

wood can be given any desired strength and hardness, matching the qualities of metals, other minerals, or of especially hard woods, even though ordinary fir, pine, poplar, beech, or cottonwood is used as the raw material.

Plywood and compregnated wood are playing an increasingly important part in airplane construction, where this new material, comparable to plastic steel or aluminum, saves metals and time, one as critical as the other.

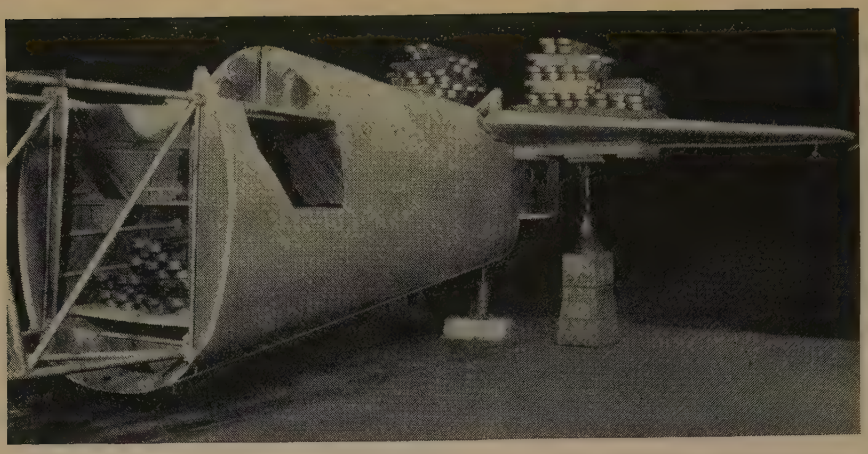
Some of the basic plywood principles are involved in the development of fiberboard. In this process trees are chopped into small chips. The wood fibers are separated from each other by a type of explosion or between grinding stones, and water added until a uniform, semi-liquid mush is obtained. This process reminds one of the melting down of metal ores into a uniform liquid at which stage alloys are made and then poured, rolled, or moulded into final products. Alloys are also made of the wood fiber liquid by adding substantial quantities of artificial resins and other chemicals or coloring substances. Finally the water is eliminated and the fibers pressed into plastic boards.

Such fiberboards are excellent insulating material. Used in peace times to enable young lovers in telephone booths to keep their sweet messages to themselves, or to permit families to find quiet and sleep even when the neighbors have a party, they are now used for insulating army huts against the tropical heat of Egypt or the arctic winds of Greenland. Hard fiberboards can also be used as panels, for floors or furniture, and many other purposes. In most cases these fiberboards are nothing less than reshaped or synthetic wood, made to the desired dimensions, hardness, strength, color and quality.

Thus wood as a building material has donned modern dress. The original form of the tree is no longer decisive. Provided it contains fibers of normal composition, wood can now be processed into building materials of any shape and of precise chemical and mechanical properties. Forest management can now concentrate on the production of such raw material. Moreover, with the possibility of using many trees with natural defects, it will be possible to use a more substantial part of the forest crop.

Almost a full century ago, in 1843, a man by the name of Keller discovered another possibility for using wood fibers. By separating them from each other between grinding stones and then pressing them into thin sheets, modern manufacture of paper was made possible. The pulp and paper industry was born. By various chemical and mechanical processes there is now an annual world production of approximately 25 million tons of various paper tissues for newsprint, writing papers, wall-coverings, wrapping papers, paper bags, and several thousand other uses. A short time ago the paper on which these words are printed was still contained in a beautiful green tree standing in some American forest. Paper consumption has risen constantly during the past century. Yet, although paper requirements in this country are far greater than in any other section of the world (both as to total output and per inhabitant) and although the war has brought pulp and paper output to an all-time high, this industry absorbs no more than five percent of America's annual wood crop.

For the last 20 or 30 years the cellulose industry has developed at an enormous rate another product, called rayon, an artificial fiber that now widely replaces silk, cotton and wool. The manufacturing process of rayon starts exactly like the production of pulp for paper. At a certain stage,



PLYWOOD IS PLAYING ITS PART IN THE WAR BY ITS DISTINGUISHED SERVICE TO AMERICA'S AIR FORCES

Here tests are being conducted to find the strength of plywood on the rear fuselage and horizontal stabilizer of a training plane. New frontiers are now being opened to wood in various forms in the field of aviation, holding tremendous promise of valuable use when peace is restored.

however, the fibers are not pressed into paper sheets but dissolved into a yellow, honey-like syrup called viscose, which is then forced through fine apertures into a liquid bath where it hardens into a silk-like thread. Gradually these artificial fibers are taking their place, not as substitutes for the traditional yarns, but as an ever-increasing and substantial part of the world's textile production. At present only a small fraction of European fabric requirements are covered by so-called natural fibers, 80 percent or more being derived from wood. The world output of rayon has reached more than ten times the world production of natural silk; artificial wool amounts already to one third of the world's yearly sheep wool supply. Only a hundred years ago all paper was made from cotton linters and other natural fibers. Today less than eight percent of all paper is made from other materials than wood. A similar development seems to be taking place for textiles. And again the tree is used as the vegetable plant that supplies the necessary raw material.

The wasteful open fireplace is becoming a luxury of little more than romantic and sentimental meaning. But modern wood-burning stoves, central heating equipment, and even industrial furnaces now permit fuelwood, and use its full caloric content. Properly burned, wood competes favorably with coal, especially since it is much cheaper to produce fuelwood than to lift coal from the depth of mines.

Recently, fuelwood has taken on the job of producer of gas for driving motor engines. Charcoal or small wood chips are burned in special cylindrical tanks, where they develop a gas similar in composition and effect to the vapors of mineral oils. Brought up by a system of pipes to the carburetor of the engine, wood gas drives automobiles, locomotives, tractors, as well as stationary engines. Large numbers of these vehicles are used all over Europe and ease the gasoline shortage of the Axis powers. They have been introduced recently in Japan, Russia, Australia, and even Canada, and, before the war is over, may well appear even in this country. Later this modern use of fuelwood may become a permanent development, supplying locally-available fuel to farmers, forest industries, general transportation, and power in richly-forested areas.

Wood is rapidly forging ahead in the production of food, fodders, alcohol, and its almost unlimited number of derivatives. Two-thirds of all the solid matter in a tree is cellulose. Cellulose is a carbohydrate that can be converted into other carbohydrates. This sleight-of-hand is done by wood hydrolysis, a process that mixes sawdust with certain acids—presto! wood cellulose becomes raw sugar. Similar to the molasses from cane or sugar beets, it can be used to enrich cattle fodder; be transformed by fermentation into dry yeast containing 55 percent of pure protein; or used to make ethyl alcohol. The latter is required in ever-increasing quantities for explosives, as a chief component of synthetic rubber, or as an admixture with gasoline to render it knockproof and to increase its octane count.

Both this process and its simplified version, the processing of waste liquors from the pulp industry, are being applied on a considerable scale in Europe. They are gradually finding their way to other continents. Since they produce a number of essential and critical war materials, the present significance of these processes is obvious. But since the products are cheap in comparison with competitive articles, and the raw materials are available in abundant quantities, the wood chemical industries (of which wood hydrolysis is just one, although the basic form) are likely to become a key industry in the world economic structure of the near future.

In the course of forest management a number of by-products are obtained—bark, resins, tree stumps, limbs, and leaves. Even more by-products, hitherto largely unused, are the "wastes" of the processes of manufacturing lumber, pulp, or alcohol. Some of these left-overs have been used for the production of charcoal or for wood distillation, by which methanol, furfural, and acetic acid, in addition to charcoal, are derived. Yet charcoaling in ordinary kilns is as wasteful as the burning of wood in open fireplaces, and even the improved charcoaling process referred to as wood distillation is not very economic. Its by-products cannot compete in the market with synthetic substances derived from coal.

The most important of all wood by-products, however, is lignin, the substance that accounts for one third of the chemical components of wood; that confers the necessary strength upon the cellulose cells; that is thus responsible for the difference between a tree and a cotton plant. It has now been found that lignin is a cheap raw material for plastics, that it is a fuel of high heat value, and it is be-

WOOD PLOWS THE SOIL

Wood-gas is now driving everything from pleasure cars to tractors in many parts of the world and may even play its part in the United States.

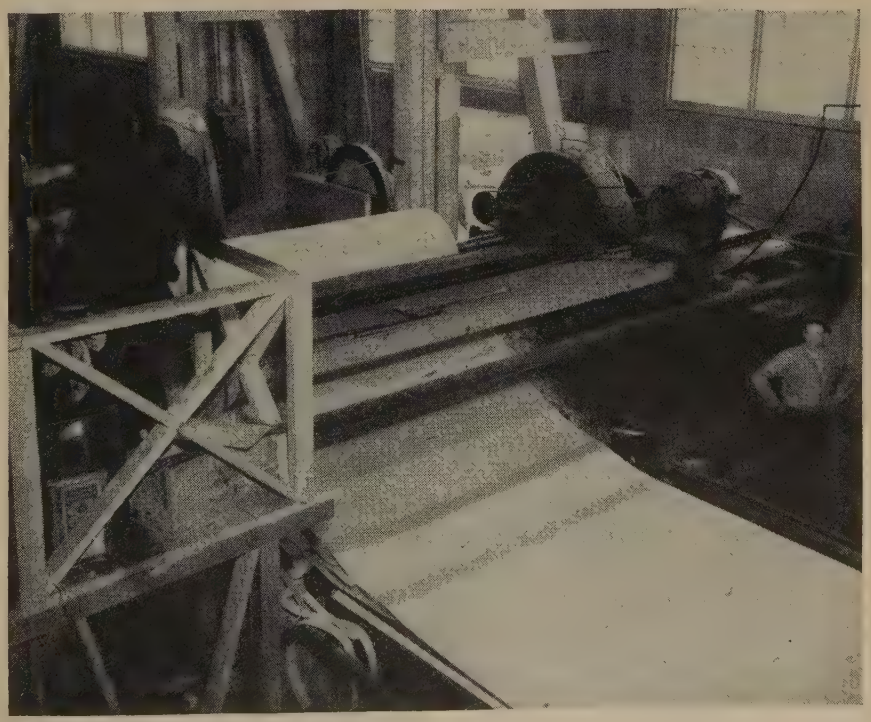
lieved that the chemical properties of lignin are richer than those of coal or coal tar. Lignin chemistry could therefore very soon become another branch of this new wood chemical industry. It might soon equal or outdo in importance industrial giants such as the German I. G. Farben Trust or Britain's Imperial Chemical Corporation, based chiefly on the chemistry of mineral products.

All these new uses—the list of which could be easily continued—are at present in full operation in Germany, Sweden, and other parts of Europe. Only the progressive methods of manufacturing building materials and the pulp, paper, and rayon industries have been developed in this country so far. The other new possibilities are, however, gradually finding their way here. Although the traditional two uses of fuel and construction materials continue to account for more than 80 percent of present world consumption of forest products, the trend has now become clear:

Open fireplaces will some time be shown in museums along with spinning wheels. Lumber and other uses of untransformed wood will continue to be of importance, but they will be restricted to cases where technique cannot improve on outstanding natural qualities, and where precisely these properties are required. The bulk of the yearly tree crop—maybe as much as 80 to 90 percent—will become a raw material for mechanical and chemical transformation, or for use as a high-grade fuel. In other words, the present situation will tend to be reversed. The traditional uses with which the term wood has been associated as far back as human memory goes will become side lines, or disappear and be replaced by modern uses based on a different conception of the significance of wood.

The present world production of wood can be estimated as roughly 1,200,000,000 tons. More than 80 percent of this —a billion or so tons—are fuelwood, or almost useless by-products of manufacture. The rest reaches the consumer as structural timbers, pulp and paper products, furniture, mine timbers, plywood, or similar high-grade products. Just as we use all of the pig but the squeal, all of every tree can be used for industrial purposes. Then the present forest production will supply three times as much raw material for the manufacture of first-grade commodities as it does today.

Seven billion acres of forest land, covering one fifth of the globe's land surface, represent a possible supply of not less than 6000 million tons of wood yearly. That is four times the present cut, twelve to fifteen times the quantity of forest products that reach the consumer at present in other forms than fuelwood. (Continued on page 440)



PEELING PLYWOOD

Layers are unrolled from the log just as a carpet is unrolled on the floor, these thin layers to be joined with others and glued and pressed into material of strength.

OLD TOPSY WAS A SILVER BADGER AND A PET

She was a favorite at the agricultural college at Fargo, North Dakota. Her kind come from the northern prairies and her coat is valuable and at its best in early spring.

Victims of persecution and misunderstanding, American badgers are—

Allies of the Farmer

By VERNON BAILEY

OVER more than the western half of the United States, where the prairie dogs, ground squirrels and pocket gophers revel in the rich soil, rich grasses, grains and low vegetation, live also these short-legged, slow, powerful little diggers—the badgers. Combining some of the characters of the bulldog and the dachshund, but denied the protection of speed, they have the fighting powers of the weasel family to which they belong, the relative strength of the bear, and the burrowing tools of the mole. They have low, wide, muscular bodies; short, powerful bow-legs, with long, curved front claws; strong jaws armed with keen cutting teeth, and a thick, tough hide much too large for their bodies. When a dog of twice his size gets a good grip on a badger, the victim simply turns inside of his skin and soon has the dog by the throat or side of the jaw in a death grip, while the dog has only a mouthful of leather to chew on. The badger well knows his advantage and never fails to face an enemy of any size until he can back up to some safe retreat, some old hole that he has previously dug. Once in his burrow he is safe, for he rapidly extends it and packs the earth so tightly back of him that even a bear could not dig him out.

The everyday life of the badger is not always so strenuous, however. On a sunny morning one may be seen lying spread out on a mound of fresh earth where it has dug out and eaten for its breakfast a prairie dog or ground squirrel. A morning sunbath is enjoyed, but if a man or dog comes along the badger gets up, takes a good look, and then generally goes down the burrow to finish his nap and be ready to go out before dark and dig up another meal—maybe a couple of ground squirrels, a few mice and a pocket gopher. Gophers often get away because their burrows go on forever, but the others rarely escape. Digging is so easy for the badgers that they are rarely overworked, and where there is a good supply of food they are apt to get fat and a little lazy. When the freezing of ground makes it difficult to live on sleeping ground squirrels and prairie dogs, a badger sometimes digs into a den of skunks, fat and (Continued on page 408)

THE BADGER OF BRITAIN, *MELES TAXUS*, IS A DISTINCTIVE ANIMAL
A male badger emerges from its natural air raid shelter after a visit below to check on the situation in the home. British badgers live a somewhat communal life, differing from our own.

With air raid shelters of their own, Britain's badgers are—

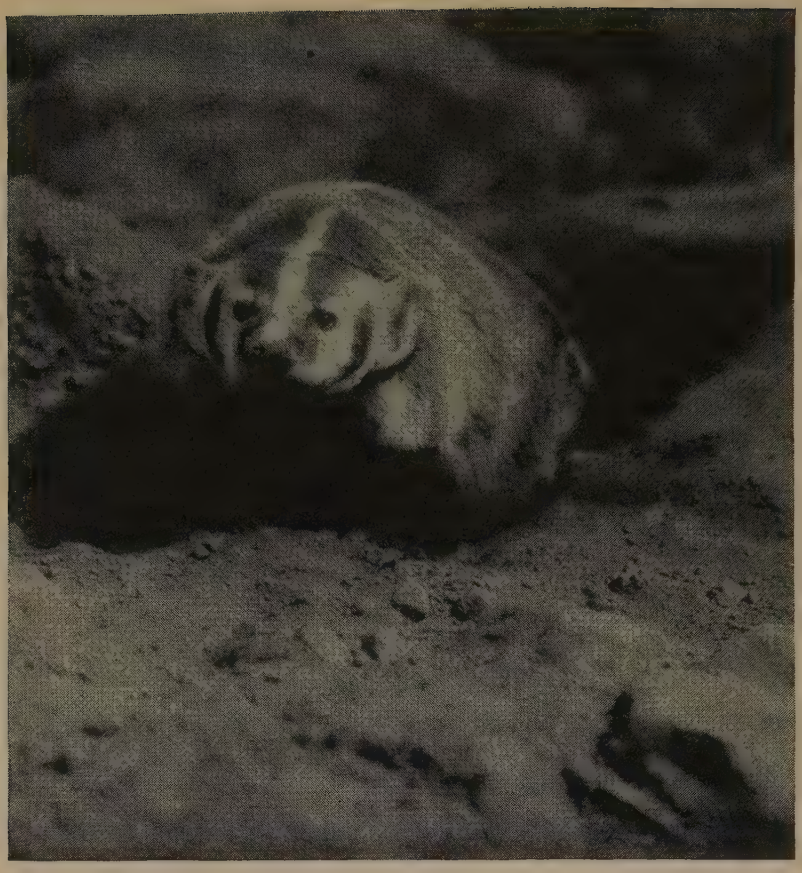
Veterans of the Blackout

By L. J. LANGFORD

In Britain, the badger ventures forth from its burrow only when twilight deepens into night. Even bright moonlight greatly reduces chances of seeing these creatures of the shadows. Centuries of persecution at the hands of man has driven these courageous mammals to excavate earthworks deep in the heart of remote hillsides. During the last two years, their existence has been made much more precarious by the flashing of countless searchlights, sustained anti-aircraft barrages, and the crump of bombs. Even so, one small colony of these animals is still clinging persistently to an old haunt on the outskirts of Bristol.

Generally, the animals are sociable, several pairs living in close proximity, the sett, as we call it, having several entrances. My friend's terrier often descended, going down one shaft and, after an interval, during which his barking could be heard far below, reappearing at another exit, perhaps twenty or thirty yards distant. The watcher must, therefore, take position to leeward of all the entrances. One evening I visited the Bristol sett quite early, and sat on the ground near a hole that did not seem much used. Half an hour later, while the daylight was still good, I was standing quite still against a tree eight feet from the hole, when a well-grown cub emerged. Without looking in my direction, or giving any indication that it was aware of my presence, it went to smell at the exact spot where I had sat, and then retired leisurely to ground again.

Although such surprising incidents may afford a particularly good view of the creature, he is usually much more cautious in making an appearance above ground. His first survey of the open is often so rapid and silent that one wonders whether one actually saw the animal's white facial stripes, or whether it was some optical illusion due to eyestrain in the weak light. One may mistake a white stone or root for the distinctive markings of the head, but the stripes, once seen, are unmistakable. They are so intensely white as to appear almost luminous as the sensitive muzzle is raised to test the air for any warning taint of danger. If his suspicions are not aroused, the badger steps boldly out to stand clear (Continued on page 409)



A BADGER EMERGES FROM ITS BURROW

Note the difference in marking and in the formation of its head and body when compared with its European relative on the opposite page.

(Continued from page 406) already asleep for the winter, kills a few and buries them in side-chambers, scoops out a comfortable bedroom for itself, and goes to sleep for the winter, or for the coldest part of it. Just how closely they hibernate or whether they become completely torpid at any time is one of the many things we do not know. But with the first big thaw in the spring their tracks may be found in the melting snow. In Texas and Oklahoma they may remain active all winter, or may stay in for a week or so during a cold spell.

Mrs. Badger is fully the equal of her mate in fighting, digging or finding food. She has need to be, for the whole care of the four or five baby badgers falls on her. She must protect, feed, train and graduate them into real badgers before fall.

Badgers show little regard for temperature or life zones, and are found from southern Texas and central Mexico to middle Alberta and British Columbia, and from sea level up to near timberline on the mountains. All they ask is soft soil and a food supply of burrowing rodents. They cannot capture those that climb trees, so they avoid the forests.

Over this wide range they differ markedly in accordance with climate and environment in different types of country. Half a dozen well-marked forms are recognized, all subspecies of *Taxidea taxus*.

A few badgers can consume a great many rodents, mostly the kinds that eat the farmers' crops and cause considerable losses. One might think that they would get all of these little farm pests, but this is not Nature's way. The rodents multiply rapidly and are generally too numerous for anybody's good, while the badgers are not very prolific and are generally too scarce. If the rodents do become scarce, the badgers just move on to better feeding grounds, so nobody needs to worry about either if both were undisturbed. Unfortunately they are not.

In general the farmer does not realize that the badger is one of his best friends. The old time cowboy hated the badgers because they made holes in the ground big enough to throw his horse and him. Of course he laid it all to the badger and took it out on every one he saw. He urged everybody to kill badgers until it seemed that the whole country was dead against these defenceless little animals, so easy to run down or shoot.

About this time some trapper sent in the skin of an Alberta badger taken in spring when its light, cream-colored, black-tipped fur, four or five inches long, was wonderfully beautiful. This fetched a big price, and all the trappers rushed out for badger skins. It took some time to learn that these silvery-coated badgers live only in the northern plains country, and that the skins of common brown badgers found over most of the country are hardly worth taking.

If I had a farm in North Dakota the first thing "planted" would be an old female badger. I would welcome her in spring, just before or just after she had her family of young, and I would see that she had all the protection and encouragement necessary to keep her contented and as happy as a badger cares to be. She could even have a chicken occasionally if she would come up to the barn to get it, and I would not keep a dog that she could not lick.

Instead of hunting badgers I would like to have a badger to go hunting with me, to nose out all the queer things they find and like to eat, and to learn something more of their interesting and little-known home and everyday habits. We have done wonders in developing every queer kind of dog, but who knows what a big weasel like a badger might show us if we had sense enough to tame and train him. One badger to a farm in rodent-infested areas would be worth real money to the farmers.

If the fur farmers would get a few of the very light-colored silver badgers from southern Alberta and Saskatchewan and learn enough about them to raise them comfortably in captivity, a new and profitable industry might be added to the north country. But do not kill any old brown badger for fur just because some other kind of badger has a beautiful and valuable coat. Let us try to use more intelligence in dealing with our native animals.

WANDERING ALONG A WELL-DEFINED PATH

This badger highway leads through the undergrowth and is often strewn with bits of material dropped when bedding is being collected for the burrow.

(Continued from page 407) of the hole, perhaps to scratch himself thoroughly before wandering off to one of the pit-like latrines that these cleanly animals regularly use.

On a favorable night in August or September, six or seven adult badgers may leave a hole in quiet succession, but in May or June it is more usual to see family groups, consisting of the sow, one or two cubs and, perhaps, the boar. The young are born at the end of February or early in March. They mew like kittens and are almost hairless. Not until the cubs are about two months old are they permitted to follow the mother on short journeys afield. My earliest record of the young being out is the ninth of May. A fortnight later, the young were romping noisily in the darkness, much as puppies or kittens play in daylight.

By the eighth of June, they had grown considerably. On that evening, the family wandered in a compact group across the middle of the sett, where the ground was highest. The boar, a huge specimen, left the sow to go down one hole after another, staying below each time for an interval of about five minutes. At last, he descended the shaft on which my camera was focussed. He paused as he came up, affording me a portrait.

At the end of September or early in October, the autumnal cleaning out of the galleries begins. Earth, stones, roots and old bedding are scraped out night after night. The debris is often equal to five or six cartloads. It adds to the crater-like step that spreads fanwise from the entrance hole, and which is so typical of a badger's earth. Where some entrances are near the bottom of a ravine or gully down which heavy rain may rush as a torrent, this accumulation helps to reduce the risk of flooding. During dry weather, new bedding is taken down. Almost any soft vegetation that the site affords—grass, bracken or moss—may be selected for this purpose. The shorter pieces fall all along the well-used tracks.

A correspondent to the *Countryman* describes his observation of a badger gathering bedding: "Next he ambled leisurely down the hillside and stopped in some dead bracken about twenty-five yards away. I heard him working hard and soon I saw him coming slowly up the hillside manipulating a heavy or an awkward load. His hind legs were rigid; he used his fore legs only to pull himself along. Between front and hind legs was a big bundle of bracken neatly arranged, stalks on one side and the ends of the fronds on the other. He brought this load across three yards of level ground in the same way as up the hill and deposited it at the entrance to the sett. Four more visits were made to the bracken and four more bundles brought up in exactly the same fashion. The badger then retreated into the sett, pulling in each bundle with his forepaws."

In winter, this intense activity dies down, but the animals do not hibernate in the full sense of the word. Hard, prolonged frost or heavy rain appear to keep them below ground, but the characteristic foot-marks may often be seen in snow. One may then easily trace the journey of perhaps five or six miles in a search for food. Occasionally, a single badger may be driven by hunger to raid a poultry farm, but in spring and summer its diet is varied and it does little harm. Young rabbits and wasp grubs are dug out with swift scoops of its powerful claws. It digs vertically down for young rabbits. Small birds and even beetles do not come amiss, but one never sees the tell-tale litter of feathers and wings left by fox cubs. Strangely enough, rabbits often may be seen leaving a sett, perhaps half an hour before the first badger is due to appear. This usually is a sign that the wind is right, particularly if the rodents feed quietly near at hand. If the breeze is inclined to be fickle, one may see a buck rabbit sit up suddenly, his nose twitching as he tests the air. If satisfied that all is not well, he thumps the ground vigorously with his strong hind legs before bolting to cover, making a drum-like sound that is well understood by every wild creature within hearing. Thereafter, one seldom sees anything more for that night at least, and it is a good plan to retire as quietly as possible down wind, resolving to try again as soon as conditions promise to be more favorable.

ITEMS USED IN THE PEYOTE CEREMONY

These are the mescal bean necklace, "peyote" necktie, pheasant-feather fan, gold-fringed altar cloth, "smoke-stick" carved with bird, eagle wingbone whistle, drumstick, peyote buttons, cornhusk cigarets, bundle of sage plumes, powdered cedar incense, beaded drumstick and necklace. From "The Peyote Cult" by Weston LaBarre; courtesy of the Author.

Differences of opinion among officials, missionaries, physicians and Indians have caused a—

Storm Over Peyote

By WALTER BROMBERG, M.D.

FOR MORE than ten years a controversy has been gathering over the tufted head of the green-gray cactus plant of old Mexico—peyote. The dried top of this small cactus, used in ceremonials by the Indians of many sections of the West and Southwest, is supposed to possess curing powers for the ills of man, and is the link between the peyote devotee and the Great Spirit.

The spread of its use among the American Indians has alarmed many who see in peyote only a narcotic drug. Fear has been expressed by some that the falling off of narcotic importation through legal channels, and the cessation of smuggling of opium and its derivatives because of the war, may result in the spread of the peyote habit to the white population. Those in contact with the peyote ritual among the Indians echo Dr. Weir Mitchell's sentiment, expressed in 1896, after laboratory experimentation with the alkaloid of the peyote plant:

> "I predict a perilous reign of this mescal habit when this agent becomes obtainable. The temptation to call again the enchanting magic will be too much for some men to resist after they have set foot in this land of fairy colors."

Peyote, or peyotl—a term derived from an old Aztec word meaning "narcotic"—is eaten in the form of a dried "button", or drunk as a tea, during the course of an elaborate Indian ritual. The peyote cultists start their ceremonies at eight in the evening in a specially-constructed tipi. The technique of the rite is elaborate. The shaman, medicine man, gathers the members in a circle about him. One button, larger than the rest, called the chief peyote, is placed in the center of the group. The leader starts the songs and prayers, destined to last the night, offered to God, to Jesus and to Nature. Often a sick person is brought in and placed near the doorway of the tipi, which faces toward the East. Four mescal buttons are passed around to be eaten by each devotee. If one becomes too ill, the fluid concoction is offered. During the singing, a gourd is rattled by the leader and then by each member in time with a beaten drum. Between songs a fan of twelve feathers is swept over each member to ward off illness. The prayers are offered for the sick in the circle, and for the well-being of all present. The ceremony continues until dawn, when a meal is served. The following day is spent in feasting, resting and sleeping. Elements that bear resemblances to Christian services, vary in number with the tribe, although the form and content of the ritual is typically Indian.

The controversy over the peyote cult has drawn into it anthropologists who specialize in the primitive culture of our Western Indians; missionaries who work among the tribes of Arizona, New Mexico, Colorado, Nevada, Idaho, Utah, Montana, and Wyoming; humanitarians; Congressmen; and political writers. Anthropologists are discussing the tribal significance and derivations of the peyote cult. Humanitarians are defending the use by the Indian of the drug in their religious ceremonies as a sign

THE CEREMONIAL TIPI OF MEMBERS OF THE PEYOTE CULT IN IDAHO

This is a group of the practitioners of the cult on the Fort Hall Indian Reservation. The details of the peyote ritual and the paraphernalia used may differ with the different tribes in small degree but are generally closely alike. The greatest difference is in the relative emphasis on Christian religious practices. Photograph courtesy of the United States Indian Service, Department of the Interior.

of autonomy of minority groups in this country. Missionaries in the field denounce peyote as insanity-producing and the cult as a type of spurious—or worse—Christianity. Complaints and cross-complaints have forced the United States Senate to conduct investigations of peyote practices among the Indians of the Southwest.

Whence comes the storm over the lowly cactus plant? Why has the dried top of this plant, the "mescal button", so called, become the center of scientific, religious, racial and political controversy reaching to the door of our Capitol? The crux of the matter seems to reside in the use of peyote in these religious curing ceremonies.

Missionaries working in the field are bitterly opposed to the peyote cult; the Indian Service of the Department of the Interior not only tolerates but actively underwrites it. In its stewardship of the Redskin the Indian Service fosters Indian arts, crafts and traditions. Medical workers, missionaries and some Indians themselves, however, complain that peyote causes sexual license in the young; dullness, inertia and laziness in adult workers; disruption of family and community life. Those in charge of Indian affairs reply that the cactus plant is not habit-forming, and that it produces hallucinations of vision that fit into the psychology of the Indian. Peyote belongs, they claim, to the emergence of the basic Indian culture, submerged up to now by the white man's insistence on superimposing his civilization on the aboriginal one of the American Indians. This viewpoint, and its opposition, has stirred controversy and sent scientists scurrying to understand what it is all about.

About ten years ago, John Collier, then executive secretary of the Indian Defense Association, was embattled with the federal administration on the question of the encroachment of the white man upon the Indian way of life. In 1933 Collier was appointed Commissioner of Indian Affairs. Immediately he set out to give a new deal to the Indian. After months of planning, the Wheeler-Howard Bill, or the Indian Reorganization Act, was presented to Congress early in 1934. It purported to free the Indian in his own domain; to create a group of people who were to resurrect their old culture, social organization, and religion, and dwell in the West and Southwest apart from the white man.

The bill in its original form was an interesting document declaring for practically complete Indian self-government. A charter, offered each tribe for adoption, proposed that the land belonging to individual Indians be held in communal ownership by the tribe: that the community act to adopt a constitution, to appoint officers, to cultivate arts and crafts, to establish courts, to manage and control property. The numerous provisions of this original bill, including the denial of the right of any Indian to own property as an American citizen, were erased in the actual legislation passed by the Seventy-third Congress. The communal ownership of land did not become law except that in the future "no land of an Indian Reservation . . . shall be allotted in severalty to any Indian." Constitution and by-laws were left to majority vote of the adult tribal members.

This political digression provides a background for understanding the approbation of peyote usage by the present Indian Service. The administrative philosophy included opportunity for the Indian, through peyotism, to "reestablish some harmony between himself, the world, and God." The peyote user attests that he contacts his Supreme Being while under the influence of the plant, then attaining a state of perfect harmony.

An attendant circumstance, which helped bring this philosophy to life, was the establishment in 1918, in Oklahoma, of the Native American Church. This church

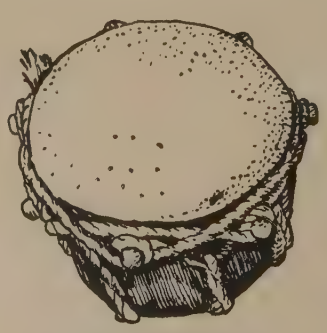
featured the peyote ritual in its ceremonies. Until that time, peyote, which had been used in northern Mexico and carried across the border, had spread sporadically from the Kiowas and Comanches in Texas through the Cheyennes to the Utes, Piutes, Shoshones and Navajos. The Native American Church, which numbers its members in the thousands, gave the unorganized peyote cult an impetus, infusing into it elements of the Christian service. It was this move that allowed the masters of Indian Affairs to aver that peyote bridged the gap between the old and the new. Chief peyote, or father peyote—the large mescal button placed in the center of the ritual tipi—is to the peyote cult what the sacrament is to the Christian religion. The religion is essentially Indian in content and ritualistic form. Peyote, "the compassionate", guides the traveller along the right road. The doctrines of the cult which fit so closely into the Indian scheme of things are that peyotism is for the "good" and opposes the basic "badness" in man himself. As one Indian put it: "Peyote lets us cleanse our minds and souls of all dirt." The soporific influence of the cactus fuses the yearnings of the Indian with the universe in which he lives. The cultists believe that the cactus plant attains powers of healing through God, which no white man's medicine can approach. They also believe it drives out alcoholism, and makes for harmony, goodwill and the "straight Indian way" among them.

THE PEYOTE IS MOSTLY ROOT

The crowns, when cut off and dried, form the "mescal buttons," which are eaten or brewed into a tea. Photograph from Richard E. Schultes

Anthropologists, like Dr. Franz Boas and Dr. Ales Hrdlicka, declared some years ago that the evil influence of peyote is "exaggerated beyond all bounds", and that it was one of the means which has facilitated the transition from primitive beliefs to an amalgamation with Christianity. Other ethnologists insist that there is much mis-information about peyote. Scientists considered to be experts on Indian life and customs, record cures of alcoholism through its use. The supposed aphrodisiac effect of the plant is denied by many. R. E. Schultes of Harvard, the ethno-botanist, and others have never seen any tendency to commit violent acts through peyote, nor any loss of consciousness among its users. They cite the good health of old Indians who have used it for years. A representative of the Taos Pueblo Indians, who was acquainted with the button for years, wrote that peyote is no worse for the Indians that wine is for the whites. To use his words: "The Indians, in their religious ceremonies, chew peyote and sage, and I do not know that there is any difference between that and crackers and wine."

The missionaries have another story. Those who have lived among the Indians have collected a large amount of data tending to show that it is a vicious substance. For example, Winnebago Indians in Nebraska testified in the Senate sub-committee hearing in Santa Fé that a few drops of peyote given to babies have killed them. One Winnebago Indian relates a vivid story of a tribesman who, during a ceremony, imbibed peyote tea for four days and four nights and "then staggered around the church, rising to his feet, and bid goodbye to his friends and said, 'I am going to Jesus,' and dropped down dead." The use of peyote as a medicament in healing of physical diseases that are much better handled by white medicine, makes a particularly arresting story. One physician in the missionary service reports a case from a Southwest reservation, of a girl who was under treatment for tuberculosis. While making good progress, she suddenly quit reporting to the physician, was taken into the peyote cult, and died several months later. An even more striking case reported by this physician was that of a boy with a febrile disease who was doing well under medical treatment until, on the day of a cult meeting, the visiting nurse found him stuporous and unable to explain what had happened. He died the next day. Neighboring Indians contributed the information that he had been given peyote as a means of relieving his condition.



CEREMONIAL DRUM

What might be more serious are the mental effects of the drug. These have been described by scientific experimenters as the occurrence of hallucinations of pleasing kaleidoscopic visions, a general bodily stimulation, a feeling of good will and something akin to religious ecstasy. Experimenters describe the physiological and psychological effects of peyote as passing off after several hours, leaving little but nausea and a memory of pleasant hallucina- (Continued on page 444)

In ocean depths and in tidepools we find—

Sea Spiders

By JOEL W. HEDGPETH

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SEA SPIDER FROM THE ANTARCTIC
This is one of the ten-legged kinds, although the majority have only four pairs of legs. Some of the most interesting forms are found in the northern and far southern waters, where they vary most from the usual. In the photograph the specimen is shown at about one and one-half actual size.

OF ALL the strange creatures that live in the sea, none are stranger than the sea spiders. While many of the Pycnogonida, as they are officially known, do resemble spiders, particularly some of the more unpleasant, fuzzy kinds, they are only remotely related to terrestrial spiders, and they are altogether harmless. There are more than four hundred named species of these curious animals, most of which crawl among the hydroids and sponges near the lower tide limit of the rocky coasts around the world, especially in the temperate, arctic and antarctic regions. They thrive best in cold waters, and the common forms that extend from the coasts of Europe and America into the arctic regions are larger in the northern parts of their range. Sea spiders have been dredged from 2500 fathoms deep, where they must wade about the abyssal ooze like lonely ghosts, yet a few, from shallower parts of the ocean, ascend to the surface during their breeding seasons and have been taken in surface tow nets.

A sea spider is easy to describe for there is not very much of it. A number of legs, usually four pairs, are attached to a series of segments in the middle—the body. There is a simple nervous system consisting of a set of ganglia for each of the various appendages. A digestive system extends far out into the legs because there is so little room in the body, and terminates in an absurd tubercle-like abdomen. The reproductive system also occupies the legs, and there is a rudimentary circulatory system. There is no respiratory system, for the pycnogonid breathes through its chitinous coating. The eyes, when they are present, are mounted in a turret-like eminence near the front of the body. There are four of them, so placed that the animal can see all 360° around it, although there is little in the uneventful life of the sea spider to require such extensive vision.

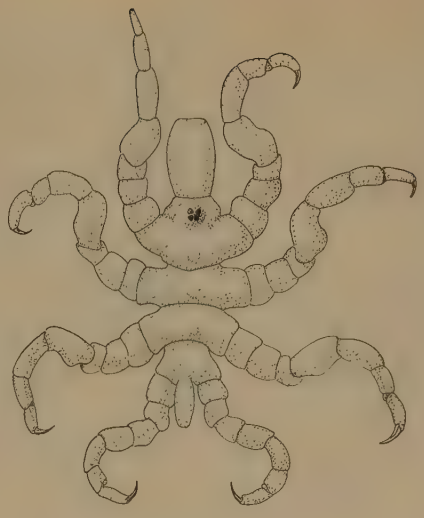
COMMON SEA SPIDER OF THE ATLANTIC
This one is found often in colonies of hydroids in the tidepools of the eastern seashore.

The most conspicuous external feature of the pycnogonid is its proboscis, an elaborate soup straining device (the mouth is at the very tip) for sucking the juices from the hydroids, sea anemones and occasional nudibranchs on which it feeds. This proboscis is a fantastic bulbous affair in some of the species, and in others it is an attenuated pipette, but its function is always the same, to poke against some soft animal and suck out its body juices. It would hardly do, however, to consider the pycnogonid a predacious animal because of its feeding habits. As an adult it seems rather to be a haphazard ectoparasite, which, in the case of those individuals feeding on large anemones, is immune to the potent stinging organs of the host. The pycnogonid in turn, however, does not provide food for any other animal except when accidentally taken in by a duck or a fish with a mouthful of hydroids or seaweeds. Such an accident would seem to afford little nourishment.

Flanking the proboscis in many of the species are a pair of formidable pincers, or chelifores, and a pair of palpi. Neither of these appendages seem to be essential, however, for one or the other, or both, are lacking in some groups, and this artificial detail constitutes the basis for classification of the dozen families and fifty odd genera that have been recognized by specialists. In addition to the four pairs of legs, which vary from the short knobby ones of the common *Pycnogonum* to the fragile drinking-straw af-

fairs of the huge abyssal *Colossendeis,* many species, especially the males, bear an extra pair of smaller legs under the body. These are called ovigers. To these ovigers, armed with elaborate spines, the male attaches the eggs and carries them about with him until they hatch. The newly-hatched larvae find their way into hydroids or anemones, in which they become encysted and there they spend a few weeks until they are able to shift for themselves. One Japanese sea spider spends its early days as a parasite of certain clams, but how it gets inside the clam is still a mystery.

Although sea spiders are relatively common among hydroid colonies, under rocks and in crannies of exposed reefs, they are inconspicuous because of their slow movements and small size. Most of the shore varieties are less than half an inch in circumference. They are often protectively colored as well; their light straw shades, tinged with brown, purple, or pink, blend into the surroundings. It is only after a mass of hydroids is spread out in a pan of sea water that the slow awkward movement of a sea spider can be detected. The larger kinds occur in deeper waters and are usually taken by dredging. Some of these, especially from the antarctic regions, have a span of twenty inches and are often encrusted with small sponges, festooned with clusters of hydroids, or adorned with small barnacles and an occasional brachiopod.



TWO CALIFORNIANS

Above is one of the well-known forms of the California coast. The sea spider below is found among California bryozoans. Note the bulbous proboscis.

The antarctic regions are the favorite haunts of the sea spiders. There they are most abundant in variety and number. Hundreds of specimens have been taken in a single dredge haul, and it is a rare expedition to those parts that does not return with an extensive collection. In this part of the world the most interesting of the sea spiders are found. There are several species with five pairs of legs instead of the usual four, and one has six pairs. Except for the additional pairs of legs, these pycnogonids closely resemble normal eight-legged species, and have been classified in the families they resemble otherwise.

Finding a place for the pycnogonids in the general scheme of arthropod groups has not been so simple, however, and the attempts of earlier zoologists to classify them with crabs or true spiders never quite succeeded. These attempts have been abandoned and the sea spiders are now recognized as a separate class, of equal rank with the Crustacea, Arachnida and other classes of Arthropoda. But such goings on have no influence on the sea spiders themselves, which continue about their strange ways no matter what the zoologists choose to call them, crawling over the bottom of the sea, foraging in the tidepool wildernesses and serving no purpose in the order of life that is apparent to us.

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The Quality of Mercy

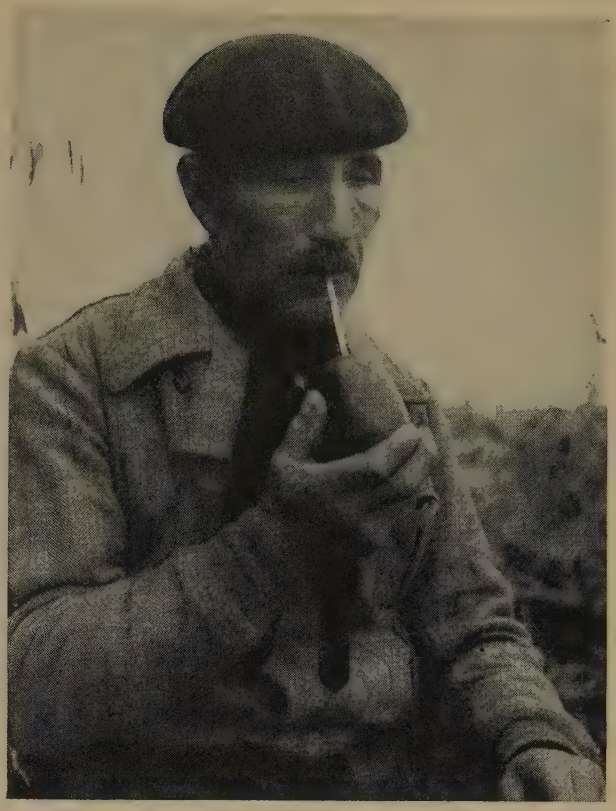
By ROSALIE EDGE

Slender, dainty, with upturned, lace-veiled hat,
Gossamer stockings, fragile high-heeled shoes—
What tender pity on her rose-curved lips,
What trembling of her little suède-gloved hand,
When searching among the crushed crisp bills
That filled her purse of petit-point, she found
Coins of shining silver which she poured
With tinkling music into the blind man's cup.
Not he—his wearied dog had touched her heart,
Hungry, one eye running with a sore:
"I cannot bear, I cannot bear," she cried,
"That any little beast should suffer so!"
And sobbing, up the cathedral steps she ran,
Soft-wrapped
In a coat of a hundred-and-thirty skins of mink,
Steel-trapped.

A relative of our holly, a South American drink, is —

The Shrub Called Paraguay

By ELSIE A. PARRY



A GAUCHO SIPS HIS MATÉ
A little meat and a lot of maté provide nourishment that seems to enable our neighbors to the south to do heavy and continuous labor. It is sipped from gourds through straws of silver by those whose financial station in life permits such luxury.

To a northerner holly is a word with definite and delightful associations—snow and scarlet ribbons and the jolly festivities of Christmas. But to a Brazilian or an Argentinian (if he's up on his botany!) holly means the national beverage, as indispensable to him as tea is to a Chinaman. He calls it maté, to be sure, but the ground-up leaves that make the pale-green infusion he likes so well come from a cousin of the decorative holly. A not-too-distant cousin, at that, and by no means a "poor relation!"

The Spaniards and Portuguese of the sixteenth century, digging out information bit by painful bit about the vast land they had stumbled upon, found the aborigines using the dried leaves of a native evergreen shrub to make a simple but highly effective beverage. The plant, like most of the others in this fascinating wilderness, interested the Europeans not at all. They were looking for gold and precious stones, not botanical oddities! But the Jesuits of the next century, with a calculating eye on agricultural possibilities, undertook the cultivation of the unromantic shrub in Paraguay and the province of Rio Grande de San Pedro. The idea was sound enough, but fortunately or unfortunately, depending upon the point of view, *Ilex paraguariensis* grows so abundantly and so well in a wild state that even today cultivating it is more or less a waste of energy. The Jesuits' labors, while not commercially profitable, did arouse interest in the plant and were responsible for two of the other names that maté goes by—Jesuit's tea and Mission tea. It has also been called St. Thomas' and St. Bartholomew's Herb, designations that derive "from the notion that it was poisonous until one of these apostles miraculously changed its properties."

LEAVES, BLOOM AND BERRY OF MATÉ
An early picture of the plant published in London in 1837, where for a time it enjoyed great popularity as a beverage.

Ilex paraguariensis, called *caa* by the ancient Guarani Indians, is indigenous to southern Brazil, Paraguay, and Argentina. The shrubby tree flourishes best at heights of from 1500 to 3000 feet, growing always in great clumps of thick vegetation. Curiously, it is the natural successor to the pine-tree, thriving uncultivated in places that commercial lumbering operations have swept clear of virgin timber. It may be noted in passing that the tree, despite its relationship to the holly, closely resembles the orange although the leaf is softer. The five-petalled white flowers grow

in clusters that are small and are only mildly decorative.

It took the Europeans a considerable time to tame even a small section of the new continent and to convince the natives, by persuasion or otherwise, that cannibalism did not pay. For this gratuitous enlightenment and the subsequent benefits of European civilization the Indians were obliged to pay tribute. In the province of Buenos Aires the annual tribute to the Spanish Crown was paid in *yerba caa-mini* (miri), the finest Paraguayan tea. When the Jesuits were being hounded out of the province (1768), the dismayed people of the Mission of San Luis sent a petition, written in the native Guarani, to the Governor of Buenos Aires, ending:

"....if your Excellency, good Señor Governor, will listen to our prayer, and grant our request, we will pay larger tribute in the *yerba caa-mini*...."

The Spanish and Portuguese, after the gold-rush and conquest fever had abated somewhat, took kindly to the unprepossessing weed whose dietetic virtues were unmistakable. They discovered that a man could do heavy and continuous labor on a little meat and a lot of maté. Maté drove away hunger and fatigue, injured neither stomach nor nerves, discouraged indigestion and rheumatism. It was, moreover, to be had for the picking. And there were plenty of Indians for that. A brisk trade in Mission tea soon developed. By 1765 maté was being mentioned in accounts of the country. One English traveler wrote:

"Merchants of Buenos Ayres also receive great quantities of the herb called Paraguay, which is of great value in these countries; the use made of it being to compose an infusion, or tea, to recover such persons as work in the mines from those terrible cholics, and intolerable disorders of the stomach, as are caused by the exhalations of such places. The herb of Paraguay is of two sorts; the Camini (the small or fine *caa*) and Yerva con Palos; but they are usually mixed together, notwithstanding the one is double the value of the other. Those who go to Paraguay to buy this herb are obliged to stay two years before they return: the first crop being always bespoke, and disposed of; so that these traders must content themselves with making the best bargains they are able for the next crop.... The annual amount of this trade is at least a million pieces of eight, or 179,166£ 13s 6d sterling; all paid for in goods, because no money is permitted to pass in the government of Paraguay..."

Another hundred years were to pass before maté appeared on South American export lists, but the local demands were so great in the eighteenth century that the herb of Paraguay has been credited with being "almost as fatal to the Indians of Brazil as mines and pearl fisheries had been elsewhere." The unthinking cupidity of the Spanish and Portuguese drove them to cut down the *Ilex* trees from which the natives had conservatively pruned only the leaves and the more luxuriant branches. This destruction of the woods made it necessary to penetrate farther and farther into the difficult wilderness, where blood-thirsty insects and back-breaking toil took heavy toll of man and beast.

International interest in maté might have developed much sooner than it did, but for the business acumen of certain English tea-dealers. In the early eighteen-hundreds some Britons, by express permission of Philip V, took the herb to England, where it speedily became popular. Whereupon the tea-dealers, worried over an imminent loss of trade, hired a physician to deliver a spirited opinion against the new beverage: "It was highly injurious to health, beauty, and fecundity!" This opinion would certainly have astonished the hardy South American Indians had they heard it. But the fact remains that foreign interest in maté waned until the nineteenth century.

Preparing maté for market is a simple process that the centuries have done little to change. The cut twigs are brought to the curing ground (*tatacua*), a clearing in the woods where the ground has been tamped hard and smooth. The twigs are laid over a slow fire "where they crackle like laurel." After this initial toasting they are spread upon a dome of saplings, beneath which a fire is kindled. The roasted (but not over-parched) branches are then beaten with switches to pulverize them. This product is known as *yerva de palos,* an excellent but somewhat coarse grade of maté. A finer quality is obtained by first removing the stalks and large fibers. The stripped leaves are toasted very slowly and beaten only slightly in wooden mortars to retain as much as possible of the delicate flavor. Nowadays the tea undergoes further treatment in local maté mills before it is packed for shipment, but the basic method of preparation is an inheritance from the ancient Guaranis who discovered it.

Nor has the preparation of maté as a beverage changed much with the years. The Indians chewed the herb, but they also turned it into an infusion by the addition of boiling water. This they sucked up through a reed or a pipe of wood from a bowl of horn or a gourd. The Europeans used silver-trimmed gourds, or cups made of *Palo Santo* or holy wood, *Jacaranda,* which was thought to possess wholesome properties. If they could afford it, they sucked up their maté through a silver tube whose end was enlarged to form a strainer for the powdered leaves. It was quite *comme il faut* to pass the maté gourd and bombilla from person to person, and for a guest to refuse to drink from the common vessel was considered extremely bad manners, however unsanitary he may have thought the practice. The maté was taken plain, sometimes with sugar, sometimes with lemon or orange juice added to combat biliousness, sometimes with milk, when it was known as *maté cocido.*

The old-time *gaucho* lived an active life on a diet of meat and maté. The latter supplied his dietary lack of vegetables and bread. Much more recently the tough little Paraguayan armies marched and fought and overcame jungle fevers with its assistance; it is an essential item in the meager diet of the *quebracho* lumbermen of Paraguay and Argentina, whose work demands physical stamina in an uncooperative climate. Non-alcoholic and containing less caffeine than either tea or coffee, the innocent-looking maté manages, nevertheless, to impart not only "oomph" to the diet but a palate-tickling flavor as well.

SCARLET SAGE

AGERATUM

HOLLYHOCK

NASTURTIUM

ZINNIA

The Spirit of Fall Flowers

By E. LAURENCE PALMER

This is the twenty-first in Nature Magazine's series of educational inserts

SHORTLY before Anna Botsford Comstock's mother died, she said to her daughter, "Heaven may be a finer place than the earth but it cannot be more beautiful". She had stood watching a late summer sunset over a garden before she made the remark. Could complete pleasure in the more wholesome realities be better expressed? To be sure, the world is beset by wars, greed, hate, hypocrisy and unfaithfulness; many of the finer things go unappreciated; disappointments are often discouraging. Yet rarely do these disappointments come with intelligent efforts to make our flower garden reach a climax of beauty in the fall months.

Flowers bloom in my garden on the identical plants that both of my grandfathers planted before I was born. They are about the only things I have that periodically remind me that those bewhiskered gentlemen, of whom I used to stand in awe, must have loved beauty in spite of hands gnarled by years of plowing and of milking. Although I have changed my home four times in the last forty years, and each time have discarded many things, I have never even considered abandoning these flowers pampered in my family for at least three generations. One time, when I made a rather sudden change, I sneaked back to the old home after dark and dug up these plants after all our other effects had gone.

CANNA

GAILLARDIA

Thrice in my life, I refused what seemed to be professional advancement because it meant that I would have to try to live without a garden, and the things that go with a garden. I am rather ashamed of myself for even thinking of living without the chance, now and then, to renew my energy by getting my feet on good rich soil and my finger-nails stubbed and broken. It is true that Joe, who learned his gardening in Italy and does odd jobs around the yard, does most of the routine work. But there are some tasks to which we cannot and would not trust even his acknowledged—and, by him, proclaimed—talents in this direction. While I am sure I would not care to have to make my living running a flower garden, I am equally sure that I could not live to the full without one into which to poke my fingers between sessions with the typewriter and the classroom blackboard.

Now why do you and I have flower gardens? We eat few, if any, of the plants that grow there; they give us no food, clothing, shelter and the like. They cost money to get established and labor to keep in shape. Yet, we have them, and when friends come to see us we are likely to show them the garden before we do the spare bedroom.

After dinner at a friend's recently, he insisted that I go into his garden to see

PETUNIA

HELIOTROPE

MARIGOLD

CHINA ASTER

COSMOS

the mallows he had grown from seeds I sent him one Christmas in lieu of the orthodox star-bespangled Christmas card. Other friends in the South, East and West have similar flowers from the same plants in my garden—plants that cement friendships, which our family values above most other things. It is for such real values, I believe, that most of us strive, and it is in a flower garden that at least a part of the finer side of life finds its more nearly complete expression. You can mow the lawn while you occupy your mind with business matters. You can stoke the furnace while planning a little professional strategy. You can shovel the sidewalks and solve a dry-as-dust academic problem. I do not believe, however, that you can really work in a flower garden without cultivating both the garden and the better qualities of good citizenship.

You mow your lawn because you more or less have to. You shovel the sidewalks to keep your feet dry. You stoke the furnace lest you freeze. But you have a flower garden because you *like* a flower garden. You may be a crank on gladiolas, dwarf irises, dahlias, or peonies; you may dote on formal gardens, herb gardens, Indian gardens, or old fashioned gardens, but your real goal is the joy you get from seeing the plants and showing them to your friends. The few who go off on the commercial tangent and who begin to sell the beautiful varieties they have created by careful cross-pollination immediately lose caste with those of us who are proud of our rank-amateur standing. We know that when you put a price on a gladiola it loses value as a token of friendship.

Somehow, the commercial florists have managed to defeat this idealistic philosophy. They have made us believe that when friends are sick or have died, or are getting married, or have a birthday or anniversary, that we should send flowers, and the flowers must be enclosed in the elaborate, expensive box of the town's best florist. We must not forget the box and the name on it. If we send something from our own garden, we do it with some feeling of shame, that we are a tightwad. But is it really harder to write a check, or to transplant and store through winter some prize gladiola corms? Which calls for the greater sacrifice, to call the florist and say, "Send three dollars worth of the best cut flowers you have to Mrs. Whoosiz in the Memorial Hospital", or to go into the garden and pick your very best flowers—those which you have nurtured through the years—wrap them in the best paper you can find and take them to your friend?

Way back when I was a senior in college I walked into the office of one of my favorite professors—after he had turned in my grades. It was a hot June day. I handed him a flabby, smelly package containing three brook trout that I had caught that morning by getting up before daybreak and walking some miles. There was no particular reason why I should have given him the trout except that I liked him and knew that he liked trout. He still mentions those fish, but the memory would not have survived if, instead of going out and getting that gift by my own efforts, I had called up the fish market and said: "Please send Professor George Everett one pound of your best fish. Charge it, and enclose a card saying, 'These fish are sent you as evidence of the glowing esteem of one of your students.' " What's the difference in a gift, whether we send flowers or whether we send fish? But do you think that if one of my many bosses died I would send flowers from my own flower garden to the funeral? I would not. I would call up the florist and "Say it with flowers" at so much per, or I'd join the committee and contribute so much to the wreath, the amount varying with his rank as a professor, assistant professor, instructor or what. I might, and would, supplement this formal procedure with some choice roots from my garden given to the deceased's wife after the funeral was over, and delivered to her in person without any reference as to why they were given. You can bet your bottom dollar she would remember that longer than anything else I might do. And unless I had a flower garden of which I were proud, I would be denied this solicitude for someone who needed that sort of sympathy.

STRAWFLOWER

I know of no one who has written better about the pleasure one gets from giving something for which he has made considerable exertion than Henry Van Dyke. Read his "A Sprig of Spearmint" and see what I mean. He wrote about fish, but he also wrote about sharing with others the things you like best.

Possibly this article should not be written in this style. Possibly, it should give you detailed directions for planting a dahlia, or for spraying green flies, or should include definite formulae for baiting cutworms. Much of this sort

of detail is found in the chart section, and more is in the many books and pamphlets widely available.

There are a few things some of us amateurs like to pass on, however, to beginners at raising flowers. Just before I wrote this, one of my friends who had just bought his first bit of land, and who had just spent his second Sunday with his new garden tools, looked at the blisters on his hands and asked me if it was necessary to work every Sunday the rest of your life if you wanted to have a garden as nice as mine. I assured him that if that were the case I would not have such a garden. He wanted to know how long perennials would last and how long I had had my peonies. When I told him that they had been my grandfather's and that I had done nothing to them for at least five years some of the discouragement left him and the old fighting spirit came back. When I had expanded a little on the merits of hardy perennials, he said he was going to buy a bushel of hardy perennial seeds and sow them broadcast in his garden and then forget them. Of course, I had to warn him of what would happen under such circumstances.

ROSE MOSS

If one has plenty of time and energy, and plenty of money and land, there is no reason why he should not grow the more stylish garden flowers such as the dahlias, cannas and gladiolas. But, no matter what the radio programs tell you, I should not advise the beginner to start off with such species. If you have a new home and new grounds, plant a few quick annuals such as the moss pinks and sweet alyssums along the borders, sow some of the standard sweet peas and nasturtiums for the middle of the beds, and start some hollyhocks back against the walls and buildings. But do not stake all your hopes on these. Get from neighbors, or friends, or good nurseries some healthy roots of the hardy perennials like peonies, fall chrysanthemums and some of the ornamental daisies. Get them established, and the next year add a few more, letting them take the place of the annuals you might otherwise plant. As your perennials get bigger, you may dig them up every few years, divide them and use them to occupy new territory. This territory will take care of itself if it is given a good weeding once or twice in the summer. Eventually, it may not even need that weeding.

Before selecting your stock of perennials, get acquainted with some neighbor who has a flower garden. Ask him what kinds of plants he has had trouble with. If iris borers have consistently cleaned out his irises for years, then do not spend money on expensive iris roots. His experiences with other plants may be a helpful guide. Of course, if you take your gardening seriously, you may know some things that your neighbor does not know, but he will know some things about your particular neighborhood that you cannot find in any book.

It is always good to get some idea of the nature of the soil in your garden. A heavy, hard clay, a loose, sterile sand and a deep, rich, black loam will produce different response from each kind of plant. You cannot expect plants that love sour soil, as do azaleas, to do well on land rich in lime. Choose your plants with soil facts in mind. Suggestions appear in the accompanying chart section.

Remember that the garden will be with you through the year. Do not plan it so that you have a beautiful display of tulips in the spring and a terrible display of weeds in the late summer. Plan to have your different seasons emphasize different colors. If you have chosen red tulips for early spring, then try some iris for blue for the following weeks. Let white daisies follow that. Then have some maroon monardas that will take over from the daisies, to be followed by some pink mallows and some scarlet sage, which may give way to or be supported by some cannas, themselves giving way to some golden strawflowers or fall chrysanthemums. If you follow this suggestion, your garden will never be without interest, and each ten days or two weeks it will differ from the preceding fortnight.

I like to think of my fall flower garden as being typically American. Really, it is an international, or intercontinental, melting pot. I have some brilliant Japanese barberries that grow along one border. Just inside of them are some bachelor buttons, which some people call the Kaiserblume because it is so abundant in the late Kaiser's native land. Growing comfortably with these are some Chinese asters from eastern Asia, some cannas, cosmos, French marigolds, nasturtiums, flowering maples, verbenas, portulacas and petunias from Mexico and Central and South America. I have never yet witnessed a fight in my garden between one of my China asters, which came from Japan, and a strawflower, which came (Continued on page 424)

GLADIOLA

VERBENA

FL. MAPLE

CORN FLOWER

COMMON NAME SCIENTIFIC NAME ORDER FAMILY	GLADIOLA *Gladiolus* Liliales Iridaceae	CANNA *Canna indica* Scitaminales Cannaceae	ROSE MOSS *Portulaca grandiflora* Caryophyllales Portulacaceae	NASTURTIUM *Tropaeolum majus* Geraniales Tropaeolaceae
DESCRIPTION	Leaves, erect, sword-shaped, with entire margins, stiff. Underground corms, thick and flat, with both thick and fibrous roots. Flowers, in gorgeous spikes at tip of erect stem. Florets in a spike, from 6 to 30, varying greatly in size, color and shape; usually funnel-shape.	Stems, to nearly 5 feet tall; some related species such as *C. edulis* growing to 10 feet. Leaves green, about twice as long as broad, smooth throughout, with entire margins, clasping stem at the base. Roots, heavy, tuberous, branching, with finer roots spreading.	Sprawling plant, reaching to height of 10 inches. Stem, round, fleshy, creeping. Leaves, rounded, to 1 inch long and often hidden by flowers when they are open; fleshy and usually smooth. Roots, usually fibrous and rather deeply penetrating but survive transplanting well.	Stems, climbing or sprawling, weak and rather succulent. Leaves, with long petioles, more or less round, with wavy margins, succulent and uniquely flavored. Roots, fibrous. Stems and leaves, smooth, usually light green. Intertwine forming tangled mass.
RANGE AND HABITAT	Some 200 species and many more varieties coming originally from South Africa and from Mediterranean region and Asia Minor. Now developed by culture and crossing to many forms adapted to varying conditions in many parts of the world. American plant breeders have been foremost in this work.	Native of tropical Americaalthoughthought by Linnaeus to be native of Asia and Africa. There are about 50 species native to the Western Hemisphere, some of which have become naturalized outside their normal range. Favors deep, rich, loose, well-watered soil.	Native of the mountains of southern Brazil. Introduced into United States and established in some places where it occurs as an escape, particularly in south. Survives in hot, dry, sandy soil. Good for path borders, in poor soil.	Native of Peru, with relatives including some 50 species ranging from Mexico to Chile. Best in medium rich, well-drained soils. *T. tuberosum,* grown under cultivation in South America for edible underground tubers, which are 2 to 3 inches long.
REPRODUCTION	Tender perennial. Blooms 60 to 130 days after corms are planted. Many florets open promptly at one time. Pollination by insects and possibly by humming birds. Fruit, a capsule with many seeds. Also reproduce by cormlets, which are produced from corms and run true to the parent plant. Succeeds best in rich, moist, sandy loam in full sunshine, but sensitive to poor conditions. Should be watered thoroughly each week.	Flowers, normally red or orange, with petals about 1¼ inches long and most flowers borne in twos, erect and relatively narrow, with lips orange, spotted with red. When originally brought from West Indies for cultivation in 1830, was grown only for leaves but flowers have been developed and are larger. Tender plant, subject to injury by drought, frost, too much moisture. Seeds will not germinate normally unless filed to let in water.	Flowers, single or double, crimson, red, yellow, white, 1 to 2 inches across, close in evenings and on dark days. Petals, 5, heart-shaped. Stamens, many. Ovary, 1-celled, many seeded. Seeds germinate in about 5 days and may live to 4 years. Blooms through summer to killing frost. Pollinated by insects. Since seeds germinate fastest in warm, dry weather, cool, wet weather may interfere with rapid development.	Flower, solitary, showy, 1 to 2½ inches across, with 1 to 1½ inch spur. Yellow, maroon, red, white, vari-colored or blotched, with rounded petals, 5 sepals, 8 stamens, and 3-celled, 3-seeded ovary. Seeds germinate in 8 days. Blooming begins in 2 months and continues to frost; may live to 4 years. Insect pollination. If soil is too rich, will produce many leaves and few flowers; if too wet, roots will rot.
CULTURE	Attacked by thrips, aphids, "red spiders", borers, a fungal "scab", and many other enemies whose effectiveness varies greatly with moisture, temperature and light conditions. Nicotine sulphate spray controls thrips and aphids. Water spray for "red spiders". Bordeaux mixture for blight. Corms infected with borers or fungal rot should be burned. Corms may well be fumigated before planting after outer scales have been removed.	Roots, dug in autumn, stored in cool cellar, like potatoes, started in March in sand indoors after being divided so each piece has one bud or eye. Potted plants rarely set out before May; should then be set 16 to 18 inches apart. From the hardness of the seeds comes the common name, Indian shot. Seeds may be soaked a day in warm water on back of stove before being sown.	Not reported as subject to many diseases or injuries of fungi and insects. Should be watered lightly until well established. Light cultivation and destruction of competitive weeds and good judgment in planting where there is needed sun is about all care needed. After being established, may be transplanted successfully. Will maintain themselves by self seeding.	Seeds may be soaked before planting. Plant in rows about 1 foot apart after frost danger has passed. Thin to 9 to 12 inches apart. Keep weed competition down and keep soil loosened about the plants until blooming begins. Pick flowers daily if continued yield is desired and protect if frost threatens. Plant lice important enemies, controlled with nicotine sulphate spray. Cabbage worm controlled by arsenate of lead spray. Leaves affected by serpentine miners should be picked and destroyed.
RELATION TO MAN	Highly valuable garden and cut-flower species, with many loyal "fans" increasing its popularity. Corms, planted 4 inches deep, 2 to 3 inches apart, in rows 2½ to 3 feet apart, and at 2 week intervals to spread flowering season. Cormlets planted ½ as deep and ½ as far apart as corms.	Most attractive foliage plant where mass effects are desired. Purplish-leaved species, *C. edulis* and *C. warcewiczii,* the former bearing edible tubers as well as most attractive foliage. *C. indica* is the old-fashioned green canna, so common in old gardens and in lawn centers.	Ideal as ground cover. Because of variety of color and ability to grow in poor soil popular particularly in warmer, drier regions. Flowers do not survive picking well but serve best on growing plants. Good for children's gardens, and for path borders.	Useful plant for borders and for cut flowers. Leaves may be mixed in salads effectively, and young seeds are commonly pickled or eaten raw. Some forms perpetuated by cuttings being kept through winter in greenhouses. Always widely popular and easily grown.

HOLLYHOCK *Althacea rosea* Malvales Malvaceae	FLOWERING MAPLE *Abutilon hybridum* Malvales Malvaceae	GARDEN PETUNIA *Petunia hybrida* Polemoniales Solanaceae	SCARLET SAGE *Salvia splendens* Polemoniales Labiatae	COMMON HELIOTROPE *Heliotropium peruvianum* Polemoniales Boraginaceae
Height, to 9 feet, with erect, unbranched, spire-like, hairy stems. Leaves, deep green, rough, large, lobed, long-stalked, with wavy margins, and relatively conspicuous veins. Roots, heavy, with short, side-crown buds, and with deep-penetrating root commonly branched.	Stem, erect, stiff, rather coarse, and bearing large, bell-shaped flowers dropping from tip. Leaves, somewhat 5-lobed, like some maples and giving plant its common name. Leaves, rather coarse, with prominent veins and long stalks alternate. Root, fibrous.	Stems, sprawling or ascending, over a square yard of space, climbing if support is available; break easily at joints. Leaves pointed, egg-shaped, with rather conspicuous veins. Leaves and stems, clammy to touch because of fine hairs. Both, a rich green. Roots, fibrous and rather large.	Stems, to over 3 feet high, often brittle, 4-angled, smooth and shrubby. Leaves, opposite, about 3 inches long, long stalked, pointed at end, with toothed margins and conspicuous veins. Roots system, fibrous, many branched.	Small trees or vines or shrubs in their native land, but in America, is found in gardens and greenhouses as low shrubby plants. Leaves, oval or oblong, with conspicuous veins. In *H. peruvianum,* leaves are not narrowed at base as in *H. corymbosum.* Leaves usually dark green and roughened. Roots, strong and fibrous.
Native of China. Carried to Europe by Crusaders; to America by Pilgrims; now commonly established throughout United States and through much of temperate world. Sun-loving, but tolerates partial shade. Lower leaves demand light. Grows best in well-drained, fertile soils; often as escape.	A hybrid of many species including such garden varieties as Snowball, Fireball, Caprice, Savitzii and Golden Fleece. Some 100 species of herbs and shrubs in the genus, many South American in origin. Indian mallow is closely related, more hardy and often a weed.	Most species are native of South America. This garden species is a hybrid of many others. Over a dozen distinct species now distributed by cultivation over most of the civilized world. Favors sunny exposures where soil is rich and well-watered, but will survive rather severe hardship and much abuse.	Native of Brazil; many varieties. Over 500 species of *Salvia,* including small-flowered sage used in flavoring meats and other foods. Sagebrush is not a true sage. Common cultivated sages include: Clary, *S. sclarea,* and Cardinal or Mexican Sage, *S. fulgens.*	Native of Peru, with upwards of 250 related species in the genus, all of which are native in warmer regions. Now widely distributed, and many are popular as border plants or in greenhouse. When grown outdoors, this species favors strong sunlight and normally rich soil.
Flowers, nearly stemless, but arranged in wand-like formation along main stem; large, single or double; 3 inches or more across; many colored. Many stamens fastened into a tube at bases. Fruit, a capsule with many seeds. Pollination by insects. Blooms in July to September, each flower lasting 3 or 4 days. Perennial, best treated as biennial. Propagate by seeds or by division. Seeds germinate in 5 days and live to 4 or 5 years.	Flowers, red, purple, pinkish, yellow, white or with mixed colors; open bell-shaped, dropping from slender stalks, and relatively light, sensitive. Stamens, many, fastened together at their bases, at first, enclosing the pistils but these later make their way through at their tips. May be propagated by seeds which are sown indoors in early spring to produce large blooms same autumn, or by slips which are taken in spring or autumn.	Flowers, funnel-shaped and from 2 to 3½ inches long. Colors, blue, red, white, purple and striped. Some strains have flowers with a spread of 5 inches. Stamens, fastened to corolla and nectar glands deep in tube. Flowers respond to light well.	Flowers, to 2 inches long. In edible sage, *S. officinalis,* and most others, flowers are under 1 inch long. Stamens are inserts in tube of scarlet corolla, attached at middle to short stalks. Tip of pistil sticks beyond these in some cases.	Flowers, about ⅛ inch long, violet or purple, with a pleasant vanilla scent. Some forms are white-flowered. Flowers, arranged in a compact, rather long, curved formation (cyme). Stamens, short and included in corolla. In *H. peruvianum,* the corolla is little longer than the calyx; in *H. corymbosum,* twice as long.
Self-sowing maintains production but plants freely hybridize. Sow seeds in fall after ripening, cover lightly, in deeply dug soil, transplant in spring; mulch lightly in fall. Insect pests include rose chafer, yellow woolly caterpillar, stalk borer, Abutilon moth, and a leaf roller. Control insects by picking or using arsenate of lead spray. Rusts destructive but controlled with spray of Bordeaux mixture or sulphur dusting. Red spiders wash off with a water spray. Some varieties resistant.	Plants taken to greenhouse in September may be cut back and grown at temperature of 55° F. but bottom heat is necessary for satisfactory development. Mealy bugs, red spider, thrips and aphids are bad pests and are controlled by appropriate sprays, fumigation and hand care. High nitrogen content of soil produces leafiness and few flowers so porous, low fertility soil is to be desired. Unless plant is pruned, it will be too open.	Propagation by cutting or by seeds. Cuttings made in September produce flowers in February. Double varieties must be perpetuated by September cuttings. Seeds may be planted in fall or early winter and grown at a temperature of 45° to 50° F. May be transplanted, April or May when frost danger is over. Relatively hardy plant that remains healthy when neighboring plants of other species are destroyed by insect and fungus pests. Cannot withstand frost but, with some protection, may winter safely.	Seeds sown in January, or softwood cuttings are made in fall before frost. Medium heavy soil in greenhouse and temperature of around 60° F. necessary if proper development is to take place. Early flowering, induced by shortening day by covering with black cloth. Worst enemies are the "white flies" normally controlled by cyanide fumigation. Black Arrow dust, Hitox, Multicide or Libersol. Fumigation must be done with great caution. Does not thrive unless soil is rich in nitrogen.	May be raised from seed to blooming in one year but should be started indoors if this is to be effected. Usually trained to grow on trellises. While they need sunshine, when grown indoors, they do not do well if the temperature is allowed to rise much above 45° F. in winter months. Enemies are those common to many greenhouse plants but greatest handicap to successful raising is wrong temperature. *Heliotropium* means "turning to the sun" and indicates sensitivity to sunlight.
Excellent perennial for groupings in back borders with shrubs or against a wall or building. Gives color for long period and requires little care. Occupies little space horizontally for amount of beauty vertically. Popular with amateur plant breeders.	This shrubby plant has a fair sale value for use as house plants, as gifts to the sick, and for growing in window boxes indoors or out. Will bloom all winter indoors if given reasonable care but cannot survive severe weather outside in northern part of country.	Popular for window boxes and for pots indoors. Also grows well and profusely in gardens and on trellises over walls. Proves popular for sale in spring and particularly for mass bedding in summer and fall. Provides interesting studies in genetics for those interested.	A popular bedding plant for late summer and fall; and as a potted plant, particularly in spring. Interesting to botanists because of unique arrangement for guaranteeing cross pollination. Related species used as flavoring.	Popular "old-fashioned" garden flower formerly common as a houseplant. Fragrance probably not excelled; this compensates for its usually scraggly appearance. Flowers used as long-lasting buttonhole bouquets.

COMMON NAME SCIENTIFIC NAME ORDER FAMILY	COMMON VERBENA *Verbena hybrida* Polemoniales Verbenaceae	FLOSS FLOWER *Ageratum houstonianum* Campanulales Compositae	GAILLARDIA *Gaillardia aristata* Campanulales Compositae	ZINNIA *Zinnia elegans* Campanulales Compositae
DESCRIPTION	Height of stems, to about 2 feet, with sprawling or creeping bases. Entire plant, grayish, with long, stiff, spreading hairs. Leaves, opposite, margins with rounded teeth or slightly lobed, stalked, dark, with rather conspicuous veins. Roots usually tough and fibrous.	Stems, relatively weak, to about 1 foot high, or sometimes higher and forming an open, loose mass. Leaves, blunt or rounded at base. In *A. houstonianum,* leaves are heart-shaped at base. Leaves, mostly opposite, and with distinct petioles. Roots, fibrous and much branched.	Erect stems, to a height of 3 feet, more or less short-hairy, relatively slender and stiff. Leaves, alternate, gray-green, longer than wide, entire or cleft, lower ones paddle-shaped; in some species, leaves almost entirely basal. Roots, stout and fibrous.	Stems, stiff, erect, hairy, and to 3 feet high. Leaves, opposite, compound, lobed, more or less clasping at bases, with roughened surfaces which are somewhat sticky and which show prominent veins. Roots, fibrous, relatively strong.
RANGE AND HABITAT	Native to Brazil. Introduced into United States in 1840. About 100 species in genus, chiefly native of tropical America, but some common weeds in fields and waste, dry or wet grounds, north into Canada. *V. hybrida* favors rich, well-drained loam and does best when exposed to full sunlight.	Native of Mexico. "Hardy ageratum" belongs to a related genus. Of about 30 species, native herbs of tropical America, only two appear commonly in greenhouses or gardens. Favor loose, relatively rich, well-drained soils, and withstand heat well.	Native to United States, from Minnesota and Manitoba west and southwest, but now spreading east. Twelve related American species, mostly from far west. Grows well in sandy soil, with good drainage. Favors strong sunlight. Can endure partial shade and resists cold.	Single form, native of Mexico; double form, of French origin, where it first appeared in a garden in 1856. Introduced through United States and other temperate parts of world. Best in rich, well-drained, loose loam and favors sunny areas.
REPRODUCTION	Flowers, in flat heads, on long floral stems; pink, red, white, blue, purple and mixed, tubular with right-angled border, slightly fragrant. Stamens, 4; ovary, 4-celled. Fruit, dry, ribbed nutlets. Closely related *V. chamaedryfolia* has scarlet flowers and appears greenish rather than gray.	Flowers are tubular, blue, rarely pink or white, and in heads over ¼ inch across or less. In *A. conzoides,* the heads are commonly under ¼ inch across. Flowers, fragrant, last long, always attractive. Flowers all summer, or until frost comes. If protected, it is perennial.	Flowers, in terminal heads, 2 to 4 inches across; daisy-like, yellow or yellow-orange. Related annuals *G. amblyodon* and *G. pulchella* have flowers normally red, lobes of disc flowers of former being obtuse while those of latter are acute. Pollination, by insects.	Flowers, in solitary, terminal heads, from 2 to 4½ inches across. Ranges from crimson to scarlet, salmon, rose, purple, orange, yellow and white. *Z. haageana* has orange flowers. *Z. multiflora* has slender, linear rays which are red or purple. Pollination, mostly by moths and butterflies.
CULTURE	Annual. Seeds germinate in about 8 days and live to 3 years. Seedlings raised indoors, planting in hotbeds in March or sown outdoors after frost danger. Transplant or thin, to 1 foot apart. Cultivate lightly, pinch back plants, to improve form. Pick flowers to prolong blooming. Common enemies include thrips and aphids, controlled with spray of nicotine sulphate; leaf tier, with arsenate of lead; red spider, with water spray; verbena bud moth, with arsenate of lead spray and by picking off affected buds.	Propagated by cutting to get early blooms or by seeds planted indoors in late March, or outdoors after danger of frost has passed. In greenhouse, blooms profusely through winter. Flowers must be kept picked if blooming is to be prolonged. Worst pests are aphids, red spider and thrips, which are controlled as on other species of plants. It is difficult to keep varieties to run true, so it is a gamble what may be expected from much seed that is purchased as representing unique strains. Tall and short strains seem to be more permanent.	Propagated by seeds, division or by stem or root cuttings. May bloom first year from seed, but is better the second. Seeds germinate in about 20 days and live about 2 years. Seeds should be sown early. Named varieties should be grown from cuttings to assure desired characters. There are annual forms. Not often seriously injured either by insects or by fungi. Hardy in severe weather. If flowers are kept picked, blooming will continue from June to November, long after many other common species have ceased. Typical plant of western plains.	Annual. Propagated from seeds, which germinate in about 5 days and live to 4 years. Seeds sown indoors in March, transplanted after frosts cease, thinned in rows to 12 inches apart. Cultivate lightly; water thoroughly in dry weather. Prune smaller heads to produce larger remaining heads. Enemies include leaf rollers controlled by lead arsenate spray, tarnished plant bug, controlled with nicotine sulphate spray, cut worms controlled with poison baits, and European corn borers in which case the infected plants should be burned. Humming birds visit flowers.
RELATION TO MAN	Good for beds, window boxes, or use as cut flowers. Bright colors, fragrance and durability make it popular, both indoors and out, and since it blooms into late fall if the flowers are kept cut it remains attractive longer than others.	Seeds sown in February produce marketable plants in 4-inch pots by May at 50° F. Pinching off ends develops bushiness. One of most popular of plants for growing in hanging baskets, window boxes, where they are grown with geraniums, wandering-jew and coleus. Finds ready sale at a low price.	Vivid, sprawling, hardy plants that deserve the popularity they enjoy. Flowers cut before they are open last longer than those cut when mature. In gardens, the perennials are favored because they do not need to be purchased or planted new each year.	Good in beds and borders; dwarf *Z. haageana* being better for edgings. Flower heads should be removed before seeds are formed if blooming is to be continued. Flowers, attractive; keep well after being cut, some lasting many days. Some are almost shrubby.

FRENCH MARIGOLD *Tagetes patula* Campanulales Compositae	CHINA ASTER *Callistephus chinensis* Campanulales Compositae	STRAWFLOWER *Helichrysum bracteatum* Campanulales Compositae	COSMOS *Cosmos bipinnatus* Campanulales Compositae	CORN FLOWER *Centaurea cyanus* Campanulales Compositae
Bushy annual, with stems to 1½ feet high, compact, relatively stout. Leaves, dark green, compound and divided into about 12, long-toothed segments. Glands on leaves give off a distinctive odor. Leaves of *T. lucida* not compound. Roots, fibrous and relatively profuse.	Stems, erect, to 2½ feet high, branching, with slightly sticky, short, stiff hairs. Leaves, broadly triangular, to egg-shaped, deeply and irregularly toothed, the upper being narrower than lower and being without stalks common on lower. Roots, fibrous.	Stout stems, to 3 feet tall, sometimes somewhat branched, minutely roughened with scales that may rub off. Leaves, numerous, up to 5 inches long, narrower near base, and smooth or nearly so, dry and retaining form well when deprived of water. Roots, relatively tough and fibrous.	Stems, to 6 feet high, smooth or nearly so and relatively slender. Leaves, opposite, compound, or lobed and cut into slender parts so that they look lace-like, but this is not the case with all species. Roots, fibrous and relatively strong. Plant as a whole most attractive.	Stem, slender, 1 to 2 feet tall, branching and, when young, downy white, this disappearing with age. Leaves, narrow, entire or with lower ones slightly toothed or sometimes coarsely featherlike. Surface, harsh and rough frequently. Color, dark green in mature plants. Roots, fibrous.
Native of Mexico, but greatly modified by cultivation. Grown widely in United States and Canada. About 20 species ranging from New Mexico and Arizona to Argentina. This species prefers sunny area where there is light loam and moderate amount of moisture.	Native of China and Japan. Cultivated in Europe more than 200 years; in America more than 100 years. Grows best in rich, sandy loam either in full sunshine or in part shade. Well-decayed manure makes best fertilizer. Favors temperate climate.	Native of Australia, but has established itself in gardens and in hearts of many Americans. Around 300 related species native of Europe, Asia, Africa and Australia. Is grown mostly as an "everlasting." It prefers rich, loamy soil but does well where there is plenty of sunshine.	Native of Mexico. Only earlier flowering forms hardy enough to bloom well in northern United States. Best in well drained, sandy loam which is not too rich, and which is exposed to full sunlight for relatively long periods. If soil is too rich, plants fail to bloom.	Native to Europe. Commonest in central Europe. Common name Kaiserblume meaning the Kaiser's flower. Has escaped and established itself widely in United States. Grows well in sun or shade but does best in moderately rich, moist, garden soil. Some 500 related species.
Flowers, in heads, single or double, yellow or orange and marked with brown or maroon. Heads, about 1½ inches across. In *T. lucida,* heads are clustered; in others, solitary. In *T. signata,* heads are about 1 inch across, not red marked, and ray flowers few. In *T. erecta,* heads are 2 to 4 inches across.	Flowers, in terminal heads, showy, single or double, large or small, in tints of pink, blue and white. Early flowering varieties sown in July, benched in late August, mature in January if 5 hours of additional light is added each day by 50-watt lamps spaced at 4 feet, and up 18 inches.	Flowers, in terminal solitary disc-like heads, which are 1 to 2½ inches across. Red, white, yellow, brown, pink or red, the colored portion being not the corollas of the flowers but the bracts which subtend the flowers. In related *H. petiolatum,* heads are clustered rather than solitary.	Flower heads, solitary, or in loose clusters on long stems; single or double; about 3 inches wide, with ray flowers pink, red or white, and central disc yellow. In *C. sulphureus,* rays are yellow; in *C. diversifolius,* disc is red. Floral bracts are oval and unequal.	Flowers, in solitary heads, on slender stalks, either single or double. Usually, blue but also pink, white or purple. Flower head composed only of tubular flowers, outer rows being larger and sterile and inner, much smaller. Fruit, an achene. Pollination, by insects.
Propagate from seeds which germinate in 5 days and live to 4 years. Seedlings transplant well and thrive better if transplanted frequently. Should be thinned to 15 or 18 inches apart and cultivation should be light but frequent. Will blossom from June to frost under proper treatment and may self-seed. Enemies include yellow woolly caterpillars controlled by hand picking; leaf tiers, controlled by lead arsenate spray; tarnished plant bugs, controlled by nicotine sulphate spray. In greenhouse cultivation, requirements are light soil, good ventilation and temperature of 55° F. Needs room.	Sow seeds in March and transplant to get early bloom; outdoors in May for September bloom. Cover seeds ½ inch deep. Thin plants to 18 inches apart, cultivate lightly and frequently, add a little slaked lime if soil is sour and keep fertilizer from direct contact with roots. Seeds germinate in 8 days; live 3 years. Spray with kerosene emulsion for tarnished plant bug. Mix nicotine dust in soil to control root lice. Knock off blister beetles into can of kerosene. Dig and burn plants attacked by yellows, wilt or rust. Yellows not common under glass but leaf hoppers may be serious pest here.	Seeds may be sown indoors or out and transplanted when frost danger has passed. Seeds germinate in 5 days; live to 3 years. Plants should be thinned to 12 inches apart and cultivated frequently. Blooming should continue from July until frosts come. Many seeds are produced in each head. Common pests include aphids, and tarnished plant bugs, controlled by a nicotine sulphate spray. Chief limitations to its more general growth are climatic. Favors moderate amount of moisture and does better in the warmer climates.	Annual. Propagated from seeds which germinate in about 5 days and live about 3 years. Early varieties sown in April are transplanted when weather permits, thinned to 18 inches apart, cultivated until blooming begins in September. Blooming continues until frost, in south, plant self-sows. Spotted cucumber beetles are bad cosmos pests, controlled by spraying with arsenate of lead. European corn borer, and a stem blight, also attack the plant. Injured plants should be burned to prevent spread of trouble. Since plant may break, it may be staked.	Seeds sown in fall or spring. For best results, thin plants to at least 6 inches apart. Pick blossoms before they set seed, to prolong blooming, and because flowers picked before completely mature seem to enlarge when placed in water and last longer than those picked after maturity has been attained. Not affected seriously by insects or fungi. This resistance and general hardiness makes it popular with beginner gardeners since it will succeed where others fail. Fall sown plants produce seedlings that may winterkill, but some may survive to bloom next season.
Desirable plant for border edges, or in mass plantings. Also popular with commercial florists as commercial early flower for spring sales. The flowers arrange themselves and keep well when cut. For commercial sales, seeds are sown in January; and seedlings are sold in lots of 3 or 4, in shallow containers.	Valuable and popular cut-flower plant grown best in greenhouses where cost of suggested extra lighting should be about 1 cent per flower at 3 cents per kilowatt hour. Keeps best after cut, if cut ends are in 2 percent sugar solution instead of in water. Marketed usually in bunches of twenty-five.	Probably largest and best of everlastings. Flowers should be cut when half open, in evening, for winter bouquets. Should be fastened in bunches and allowed to dry hanging downward in a warm room. May be arranged after they have dried. Bunches find ready sale at roadside stands.	Excellent plant to use in masses and supply attractive cut flowers which do not wilt readily and may last several days. Form may be controlled by pinching off parts not wanted to fill desired space.	Excellent species for border and for edging plant. One of the best for lasting qualities after being cut and so is popular in many floral arrangements. May self sow and establish itself in gardens and waste land.

(Continued from page 419) from Australia. I have some gaillardia, which hails from our midwest plains, some gladiolas from South Africa and some hollyhocks from China, and one patch in my lawn is white with an English daisy. They all seem to get along well together. I rarely see the hollyhock but to remember that we have it in our gardens because it was carried to Europe by the returning Crusaders, and brought across the Atlantic by the Pilgrim fathers. Of course, I have to step in now and then to save a struggling minority from extermination by a more dominating and numerous species, but I always remember that some of these guests in my garden are not living under conditions normal to their requirements. I realize that were some of our native plants taken to the homeland of these struggling aliens the tables would be turned. Anyway, the international aspect of a fall flower garden should interest all who are thinking of Argentine and Madagascar and Malaya only in terms of the war news. How many of the garden flowers in your neighborhood are natives of the lands where the boys of your home, street or town are now engaged in military activities? Possibly the boys, like the Crusaders of old, may send—or, better, bring—you some seeds from these foreign lands to make your flower garden more significant than it would ever be otherwise.

While I find geography in my flower garden, there are those who read other meanings into flowers. I once lived in a home where there were many young women, some of whom rather regularly received flowers from masculine admirers. One damsel was forever trying to find hidden meaning in this or that flower from this or that man. I am quite certain that the flower selection meant nothing to the sender except an expression of admiration, or a concession to established custom—probably too often the latter. That girl's persistence in reading something into white roses, and something else into red, always made me send something other than roses to my girl friends, because I never could remember what was supposed to mean what. To this day, I do not know what it is all about and care less. Do not count too heavily on the significance of any particular flowers implying any particular sentiment when it is sent by the average man. The city man who called his best girl his "little wake robin" because he thought it sounded nice did not know that his lady from the country was familiar with the odor of wake robins, and resented the implication.

While I do not know now whether I should wear a white or a red carnation on Mother's Day in memory of my mother, I do remember the flowers she liked best, and some of these flowers are in my garden. Also, there are some flowers that did not mean the same to her as they do to me. A few paragraphs earlier in this article I made a reference to weeds of which I am a bit ashamed. I advised you not to so plan a garden that in the fall it was just a mess of weeds. I did not mean to imply that I would want a garden entirely devoid of weeds. In fact, as I indicated in an earlier insert in this series to the expressed delight of some of my readers, there is one spot on our garden tract where I protect some weeds. Dandelions, chicory, goldenrods and teasels have their place in a garden. For years I lived in the middle West where purple cone flower and prairie blazing star and pasque flower and spiderwort grew wild in the fields. We have nothing in our garden that exceeds any of these in sheer beauty. Neither do we have anything that came from nursery or friends that can match a little patch of native goldenrod I have kept.

If you are attempting to build a fall garden, have limited funds and want a quick effect, do not rely wholly on the stuff you must buy or get by trade. Take a hike into the open hinterland at least once a month. Notice the plants that are putting on the best display on the least valuable land. Take a few—not all or too many, and certainly not the last—of these plants back with you and use them at least as temporary fillers for areas that eventually may be occupied by more orthodox species. You may come to like the natives so well that you may decide to keep them, or at least to devote one part of the garden to their preservation. I know one place in Iowa where blazing star grew in great profusion. It has now been taken over by suburban developments and the residents strive to make their places attractive with the usual species. What a mistake they made in destroying the native species that may be almost completely eliminated in the neighborhood by the time their children reach maturity.

You do not have to be rich to maintain a beautiful flower garden. But nothing will make you richer inside, where it counts, than a little patch of ground on which you have spent thought and effort in the culture of plants that have no value for your stomach, much value to your eye and more value to your soul.

Exchange the things you like best with the friends you like best. See if you do not develop a happier outlook on the world in general. If any of your friends are thinking of getting a divorce ask the judge to get them to work together on a flower garden. There is one place where you and your friends can find peace, and where efforts directed towards the better things of life yield visible results within your lifetime. There is one place where you can be as good and as rich as the next fellow without too much effort. If you do not have a garden, you are poor indeed. If you do have one, it may be your most valuable asset.

Remember, I still have a lot of those mallow seeds from my garden that are yours if you wish to send me something for my garden, which is in my back yard at 206 Oak Hill Road, Ithaca, New York. As gardens go it is nothing wonderful, but *I* like it and I would not trade it for plenty of gardens that I know cost much more. The latch string is always out. There is no better note on which to end appropriately an article on the spirit of the flower garden.

As We See It

THE MIGRATORY BIRD SEASON

We had no hope, we confess, that our espousal of the suggestion that a closed season for migratory game birds this year would be accepted as consistent with the fact that we are in a war for our very existence. Indeed, the early "build up" in releases from the Fish and Wildlife Service indicated an intention at least to continue the regulations of the 1941 season. These were, in fact, liberalized by providing seventy instead of sixty days of shooting in each of the three zones, and by granting a longer shooting day.

According to the announcement of the regulations, they are "based on the game-management principle that the annual take should be governed by the available game". To indicate that this principle is being observed, the Fish and Wildlife Service points out that a January "inventory" indicated a North American waterfowl population of about 100,000,000 birds. This was in contrast with an estimated 30,000,000 seven years ago when our waterfowl were "on their way out". Such an increase may sound impressive to some, but the number of migratory game bird hunters has nearly kept pace in percentage of increase with the birds. Also, it should not be forgotten that the increase is from a basic figure so perilously small that several species of ducks and geese seemed doomed to extinction and are still not too plentiful.

The Fish and Wildlife Service of the Department of the Interior is charged with so administering our supply of such game birds as come under its jurisdiction that it shall be continually adequate. In so doing it might be assumed that the Service would act only with the interests of the birds in mind. Actually, of course, the Service is under continuous heavy and highly organized pressure from the waterfowl hunters, who represent only about one per cent of the population. This pressure is offset only by less well-organized groups whose major interest is the birds themselves, and who ask only that migratory game birds be allowed to increase in numbers to a point that a combination of overshooting and drought will not wipe them out as was nearly the case in 1934 and 1935.

Duck hunters in late years have chiefly wailed that they have been foiled by "bluebird weather" with no ducks available for shooting. The seventy-day season in each zone seeks to give them an added ten days break in the weather. It gives the migratory birds, however, no break at all. The season in the northern zone starts September 26. The season in the southern zone ends January 10. Hence hundreds of thousands of the birds run the gauntlet as they migrate during that period. It is a seventy-day season *for* the hunter—if he hunts only in his own zone—and a 107-day season *against* many of the birds.

Under the regulations there is no change in the daily bag limit of ten ducks. Prohibition of use of live decoys and shooting over baited waters still holds, despite organized pressure from certain state game departments. Thus, with gas rationing in the East, and solicitude about tires a national sentiment, the ducks may be able to "take it". But if we know our duck hunter—and we think we do—he will manage to find gasoline somehow, and use up a few miles of what is left in his tires and get to the duck blinds anyway.

According to the announcement of the regulations, investigations "disclosed a decline in goose populations other than blue geese". So the bag limit is reduced. If the populations are declining from a none-too-healthy figure complete protection, such as afforded the Ross' goose, would seem logical. But how the hunters would howl! The Fish and Wildlife Service shudders to think of it.

We are happy to note that snow geese are protected in Idaho and in three Montana counties. This step is in behalf of the rare trumpeter swan, frequently shot with the lame excuse that it was mistaken for a snow goose.

Ample evidence has been presented that the mourning doves are in bad shape in many places. In fact, Dr. Ira N. Gabrielson, Director of the Fish and Wildlife Service, reports a "very material shortage of the eastern form of the mourning dove. . . ." Hence the bag limit is reduced from 12 to 10 and the season in 14 eastern states cut from 42 to 30 days. Here, again, logic would seem to demand the courage to invoke a closed season. As to the white-winged dove, we learn from reliable sources that its numbers are decreasing rapidly. We are convinced that failure to close the season on this interesting species is inexcusable, and is indicative of a degree of indifference that will be sorely regretted.

With respect to the woodcock, the report is that its condition is "somewhat improved in general but spotty". This bird is still in bad shape, but, nevertheless, the regulations provide fifteen day seasons and four birds a day.

Thus the 1942 migratory bird hunting regulations are such that the hunters have no reason to complain. Risks are still being taken with a number of our bird species. A larger harvest is made possible—and probable—than is consistent with a real interest in the perpetuation in adequate numbers of our birds. Such a policy will continue until the great majority of non-hunters demand their share in our migratory birds.

Nature in Print

By HOWARD ZAHNISER

"THE abiding contribution that books make to living —especially to growing up"—is the keynote forecast for a Children's Book Week to be observed from November 15 to 21. It is a hopeful concept at a time when the world of the elders is in turmoil; when men through force of arms and the sacrifice of life are dependent on the perilous fortunes of war for any blessings that may abide. Participation in this Week should be an inspiration to men and women and an incentive for year-round good reading to the children whom they stimulate. It is, in fact, deeply comforting to realize that there are many children who can survive the wars of their elders without bitterness and that this comfort can in part be insured by good books.

Prominent among such books, it seems to me, are those dealing with the specialized interests of the readers of this magazine. *The Seashore Parade,** by Muriel Lewin Guberlet, for example, deals not at all with the momentous military events that are taking place on certain beaches, yet its accounts of the curious and marvelous creatures along the beach seem to me to constitute a more opportune offering as a children's book now than in so-called normal times. *Horns and Antlers,* by Wilfrid S. Bronson, with his own works of art that illustrate the American deer, wapiti, caribou, moose, and antelopes of which he writes, similarly seems a better volume for this year's boys and girls than the exciting accounts of the weapons and defenses of human beings.

Thus, although the keynote sounded by the national sponsors of Children's Book Week is inspiring, it seems necessary to supplement the "themes" suggested by them in its observance. First among these suggested themes are the questions: "What Are We Fighting For and What Are We Fighting Against?" These are followed by "The United Nations" and "Our Fighting Forces". Finally the questions "What Can We Do To Help?" and "What Can Be Done For Children" are used to suggest books on family activity during war time and on the child and his relation to books during this crisis.

The last of these themes suggests, to me at least, thoughts that challenge the others, although it must be admitted that the doubt varies inversely with the age of the children. How old a boy or girl may be and still be called a child is, of course, a question. Certainly high school students are inescapably concerned with current events, but just as certainly the pre-school or early-grade child need not be deliberately introduced to the horrors of war or subjected to influences for war thoughts over and above those that are unavoidable. Caution against engaging children in the war-time horrors of their elders thus seems to apply fully to the youngest but with diminishing appropriateness to the older and the oldest children.

The caution is this: If the book a child reads and the pictures he admires are to make an abiding contribution to his living, they should deal as far as possible with those fundamental realities that are sure to be a part of whatever world his elders may bequeath to his manhood. No group of books seems to meet this requirement more fully than those which deal with the plant and animal life of the earth and the character of the universe in which they live. On the other hand no group seems so inconsistent with such an ideal as those that deal with the ways in which a particular generation solves its problems of war and peace. The one deals with a subject matter of fundamental value that the child may miss, the other with passing developments in a realm of life that his later education is bound to include. Many men and women, having missed a childhood stimulus to an interest in Nature, go through life unconscious of the wealth of significant interest in the physical universe they inhabit. This is true in peace time, and certainly the normal hazards to childhood interest in Nature should not be increased in war time by sensational emphasis upon subjects that can add little to the development of Christian character.

A knowledge of the life and death struggle that spells existence is, of course, one of those fundamental requirements of education, nor do I mean to advocate an unrealistic preservation of a child's ignorance for a later disillusionment.

I live with a four-and-a-half-year-old boy to whom I am reading *The Seashore Parade,* and with whom I am studying the pictures in *Horns and Antlers.* "A world war," I read, "is waged upon the seashore year in and year out. A peace treaty is never signed." The usefulness of fast-running legs, sharp and hard hoofs, and horns and antlers I have to explain from the text that goes with Mr. Bronson's illustrations. So, also, even to the four-year-old, I have to explain the meaning of bombers and pursuit planes flying over our valley and the significance of many men in uniform on our streets. I know full well that, young as my son is, he must know that there is a fight to live.

Yet I cannot see the advantage of reading to him the stories of war or presenting to him the picture books that portray them. I realize all too well the grim necessity of the war now being waged by the United Nations, but I do not even now see an always enduring necessity for war. On the contrary I participate in what I trust is both an undying and a noble human hope for the end of wars, and with this hope I prefer to have my son's interest in wars as slight as possible until he (Continued on page 442)

*Recently published books discussed in this article are:

The Seashore Parade. By Muriel Lewin Guberlet. Lancaster, Pa.: The Jaques Cattell Press, 1942. 197 pp., with 58 drawings and 6 illustrations in color by Jan Ogden. $1.75.

Horns and Antlers. By Wilfrid S. Bronson. New York: Harcourt Brace and Company, 1942. 143 pp., with 48 illustrations in black and white, and 4 full-page plates and end-papers in color—all by the author. $2.

Lives Around Us: A Book of Creaturely Biographies. By Alan Devoe. New York: Creative Age Press, Inc., 1942. 221 pp., with woodcuts by Frank Utpatel and typography designed by Stephen Salter. $2.

More adventures in an insect garden introduce other—

Children of the Sun

By EDWIN WAY TEALE

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This is the third and last of a group of articles based upon the author's insect garden. These articles will be chapters in a book, *Near Horizons*, which will be published this fall.

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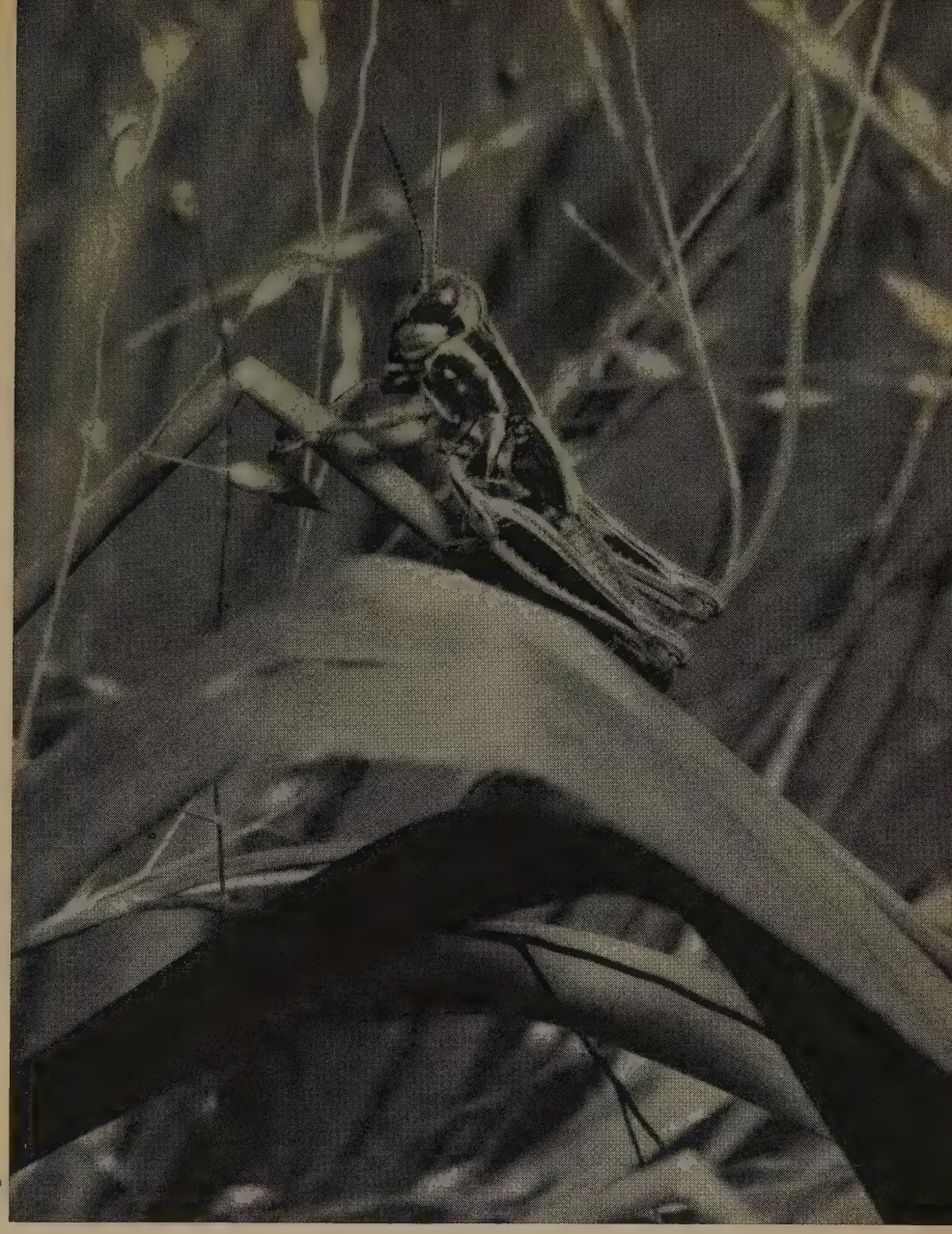


SHORT-HORNED GRASSHOPPER
This dweller in the garden is photographed in a grass tangle and shown here much enlarged. The eggs of this insect require cold to mature properly and thus carry on the cycle.

TODAY, the old trees of my insect garden are wet and still. The air is heavy with the odor of autumn—melancholy and relaxing. Mornings now are filled with the misty, glowing light that Corot loved so well to put on canvas. Spiderwebs, scattered over the grass, are bejeweled with dew. The rank growth of the swamplands is drooping. The sweet flags lie this way and that as though trampled by dodging cattle. A chill pervades the shade. Everything is hushed and the pulse of Nature is beating low.

Across the fallen maple leaves, sunlight paints long streaks of yellow. I stoop and examine one leaf closely, noting how the brownish pigment runs along each spreading vein—like corrosion following a metal rib. As I stand silent, stooping thus, an autumn fly settles down with blurring wings upon the leaf. Its legs angle out, giving it a curious knock-kneed appearance as it comes to rest. Here it remains quiet in the rays of the soothing sun.

Insects are the original worshippers of the sun. It makes them walk faster, sing faster, be more alive. Their tiny bodies respond like thermostats to variations in heat and cold. They are children of the sun, and the thermometer, in many ways, determines their destiny.

Years ago, the noted American authority on ants, Dr. William Morton Wheeler of Harvard University, reported that these insects unerringly locate their brood chambers in the warmest part of the nest. Nobody knows exactly how their delicate temperature-sense functions. But many experiments have attested to the fact that it is superior to our own.

The most famous of these ant experiments were conducted by an astronomer, Dr. Harlow Shapley, also of Harvard. During a summer spent at the Mount Wilson Observatory in California, Dr. Shapley started timing ants as they ran along the rocky trails of the mountaintop. His stopwatch revealed that the insects stepped up their pace as the heat of the day increased. At fifty degrees F., the ants covered fifty-two feet in an hour. When the mercury rose to 100 degrees, their pace was fifteen times as fast—780 feet an hour.

When this investigator held a cardboard over the line

of march, he found the insects immediately slowed down as they entered the cooler, shaded portion of the trail. They reacted far more quickly than any mercury thermometer. In fact, so uniform and so exact is the response of some species of ants to slight variations in heat and cold that Dr. Shapley found he could, at any time, tell the temperature within one degree by timing the speed of the insects and referring to a simple table he had worked out. Like chemical reaction in a test tube, the activity of these insects invariably speeds up or slows down as they are heated or cooled.

Ant thermometers, of course, have their parallel in other "temperature insects," notably the night musicians. The speed of their fiddling increases when the mercury rises. The snowy tree cricket—so pale green it appears pure white in the rays of a flashlight—has earned for itself the nickname of "the temperature cricket" by its responsiveness to variations in heat and cold, even slight.

Every autumn, I notice how these night singers are subdued by the gradually increasing chill. In late fall, I sometimes find them fiddling away in the full heat and light of midday. But when the chill of dusk descends, they vibrate their wings slowly, almost painfully. The katydids of the high, swampside grass-clumps and the black field crickets of the hillside also take to noonday serenades at this season.

One of the most curious instances of the ruling effect of temperature in the life of a butterfly is found in *Pyrgus centureae,* a gray and white skipper dwelling in such varied places as Labrador, Virginia, and the mountains of Scandinavia. No matter where the insect lives, it takes to the air at approximately the same temperature. Thus, as Dr. Austin H. Clark, of the National Museum, in Washington, D. C., reports, *Pyrgus centureae* flits about over the fields of Virginia only in early spring and appears in Labrador and Scandinavia only in midsummer.

Similarly, many grasshoppers are reported to fly only when the thermometer rises to 85 degrees or above. Honeybees can keep aloft at temperatures above 50 degrees and they can continue to walk down to 45 degrees. Below that, cold paralyzes them.

Several years ago, a cat was one of the stars of a Broadway play. Each evening, just at the right moment, it walked on the stage, approached a fireplace and stretched itself in the warmth of the blaze. How the cat was trained was kept a secret for some time. Then it developed that the animal had been placed for a few moments in a refrigerator just before its cue. When the chilled animal was released in the wings, it instinctively walked to the hearth and stretched itself luxuriously before the fire.

The moth that flies to a candle or the beetle that blunders into an electric light may be pulled to its destination by temperature, just as surely as was the Broadway cat. Its need is not warmth but the satisfaction of another call just as strong. This is phototaxis, the attraction of light. Here, however, heat and cold also enter the picture. The attraction of light for some night insects, it was found by experiments on orthoptera in the Southwest by E. R. Tinkham, varies with the reading of the thermometer. Below 80 degrees, he found, there is comparatively little activity around bright lights

RED-SPOTTED PURPLE BUTTERFLY

When several were found clinging to a wild cherry in October on a chill, misty morning they were incapable of sustained flight. One plucked from the tree and tossed in the air fluttered downward in a long slant. It was ten o'clock before the heat of the sun aroused them and sent them about the day's business.

although the insects are abroad. Above 80, the excitement begins, and above 90 the activity is at its maximum.

If you can muster up sufficient courage to approach a hornet's nest some sultry August afternoon, you may hear a curious tapping sound. It is caused, according to Albro Tilton Gaul, who has been raising hornets in observation hives, by the queen. She strikes the tip of her abdomen like a drumstick against the nest. Why does she do it? The answer to that question is unknown. But, in some manner, the phenomenon appears related to the temperature. For the staccato sound is heard only during the hottest part of the day.

THE "TEMPERATURE CRICKET"

The tempo of its nocturnal music increases or decreases according to the rise and fall of the thermometer. By counting the pulsations of its mellow fiddling for one minute and applying a simple formula, you can tell where the mercury stands without looking at a thermometer—a convenient arrangement.

The reading of the thermometer affects the lives and habits of the insects in other ways. Water surface tension, so important in the life of the pond-skater, varies in strength with fluctuations of the mercury. Baby cockroaches grow twice as fast at a temperature of 80 degrees as they do at a temperature of seventy degrees. Dr. Lincoln Petitt, who has raised thousands of these insects—whose ancestors inhabited the steaming forests of the Carboniferous Era more than 100,000,000 years ago—reports that they are delicately attuned to shifts in heat and cold. They always seek out places where the temperature ranges between 70 and 80 degrees. Below 50 degrees, the cockroach, like most other insects, is virtually inert.

The aphids that cluster on the rose shoots in my garden are, in an even stranger way, dependent upon the thermometer. During the heat of summer months, these little sap-drinkers reproduce without mating. There are only females in an aphid-cluster. With the coming of cool weather in fall, the true males appear and mating occurs. It is the eggs laid by the fertilized autumn females that carry the species over to the following year. In laboratory tests, when these insects were kept at summer temperatures in greenhouses, they went on, generation after generation, producing only females. While foliage changed color, leaves fell to the ground, snow drifted across the fields, and ice covered the ponds, these pampered insects still produced no males. Temperature alone, the tests demonstrated, controls the appearance of the male sex among the plant lice. The sun changes its position in our sky and—among the sweeping changes that occur on the face of the earth—male plant lice appear among the clusters in my insect garden!

Like Petitt's cockroaches, the aphids have a length of generation that depends upon the thermometer. At 80 degrees, a new generation of plant lice appears on the average of about once a week. But when the thermometer stands at 60 degrees, the average is twice as long.

Temperature plays an oddly different role in controlling the life history of the short-horned grasshoppers of Northern states. These locusts lay their eggs below the surface of the ground in autumn. And, just as certain seeds require winter cold to break their dormancy, the eggs of the locust need months of low temperature in order to hatch properly the following spring. Eggs dug up in fall and kept in a well-warmed room during the winter, fail to develop normally. Cold in the egg stage is essential for locusts as well as for some other insects.

A hundred feet or so down the swamp walk from the sun-streaked maple leaf where the fly had alighted, I came—later that same day—(Continued on page 444)

THE MEARNS QUAIL SUGGESTS A DIMINUTIVE GUINEA HEN

Its markings seem to make it conspicuous, but in its native high grassy valleys and rock ravines it is a part of the surroundings, protectively colored.

Shy and elusive, clad by Nature to merge with the landscape, Mearns quail are—

Spirits of the Western Pine Barrens

Photographs by William L. Finley

By IRENE FINLEY

IT WAS morning in the high pine barrens of Arizona. The trees stood straight and slim, cones and needles of the year past at their feet. Bunches of yellow-green mistletoe hung among the darker green of the dwarfed oaks and junipers. The spring underbrush of young shrubs swelled with new life. In the bare places the sun fell soft and warm. The sweet smell of balsam and the mountains were in the air. In the hushed stillness even the birds were quiet and shy. A flicker, hanging up-side-down on a tree trunk, seemed almost embarrassed at the echo of his drumming.

As we trudged along in the Sunday peace, it became quite warm. Dropping over a ridge we looked down on a little green gorge, an oasis with the promise of water. Soon we were standing at the edge of a trickle of a stream running through the green. And then we saw something else. Not only was the brook rippling, but there was a swaying among the grass and undergrowth of the canyon. Soft shadows began to move up the hillside, winding in and out among the bushes like pale veils—and were gone. Quail also had been down to the stream to drink.

More than once we had met quail folk thus, most frequently near water. They must even make their nests not too far from water so that the frail chicks may reach it soon after they are hatched. Then they will be able to follow their parents off into the dry hot places, scampering here and there like sprites, hunting seeds and insects or digging for small bulbs, of which they are very fond.

The habitats of the quail species account for their striking differences in plumage. Perhaps the most striking quail of the Southwest is the dumpy little Mearns, *Cyrtonyx montezumae mearnsi,* or "fool quail". In his camouflaged "wall-paper pattern" coat, he straggles through the hilly pine regions of central Arizona, southern New Mexico,

TWO MEARNS QUAIL SEEM TO BE DEEP IN SERIOUS DISCUSSION

The interesting facial markings of this strange and rare bird give it an erudite expression.

and central Texas. Thus its range is rather restricted.

His face is grotesquely streaked in black and white, like an Indian's at a war dance. His crest is a soft fawn with a dash of black, his back pale brown with stripes of black and white, wings with black spots, sides heavily figured with guinea-hen polka dots bordering a wide central band of velvety dark brown running from chin to tail—an intriguing oriental pattern. His mate is dressed in softer and less dramatic tones with a pinkish-brown head and no stripes, back mottled in black, brown, and lavender streaked with white, under parts light cinnamon with a lavender sheen, breast and sides streaked and speckled.

On the pale treeless desert or the wide open cactus stretches, where the blue scaled quail melts into the landscape, the Mearns quail would be conspicuous. But in the high grassy valleys and rocky ravines the Mearns vanishes before your eyes.

His habit of lying close and springing into flight only when about to be stepped on has brought him the name of "fool quail". Yet by this means he hides to the last minute his conspicuous dark front. When a Mearns quail senses discovery, he slides along faster, settles his feathers closer, and spreads his cap flat on his head.

Of the several striking quails of the Southwest, this bird seems to depend a great deal on freezing for his safety. One observer recalls seeing one of these birds squatted on a log near the trail that a pack-train was following. So well did the colors of his back and sides blend with the surroundings that some fifteen pack mules and horsemen passed without disturbing him.

One of the principal articles of the Mearns' diet is lily bulbs. They also hunt acorns and pinyon nuts, seeds and spines of prickly pear, acacia, laurel berries, and such insects as weevils, caterpillars, grasshoppers and crickets—a truly varied diet.

Unlike the Gambel and scaled quails, the Mearns does not gather in large flocks. Though well scattered, the birds are nowhere abundant. J. Stokley Ligon, who is an authority on quails of the South, has estimated that there are usually about six in a bunch, although they may range from two to twelve. Dearth of food, unfavorable breeding seasons, and deep winter snows may combine at times to reduce them to the verge of extermination. A variety of natural enemies also affect their numbers, the Cooper hawk being considered the worst destroyer of broods. Predatory animals such as skunks, bobcats, and foxes also hound their tracks. Thus the problem of existence for this interesting quail is difficult and should not be complicated by adding man to the list of predators.

Only one species of quail was a natural inhabitant of the eastern states, the bob-white or "farmer's friend". Now he is common over great parts of the country. In the Southwest, beside the Mearns quail, there are two others commonly seen in large flocks, the scaled quail (also called blue quail and cotton-top), and the Gambel quail. The Gambel loves the hot mesquite valleys and slopes, the quail brush and creasote bush, and the palo verde thickets and prickly pear patches. It is most at home about small farms, in alfalfa fields, and sometimes nests in vineyards. Old and young may be seen by hundreds in the valleys and sandy wastes. But none are so shy and elusive as the gentle Mearns that live in the high, humid regions—the Mearns, those rare, whispering spirits of the pine barrens.

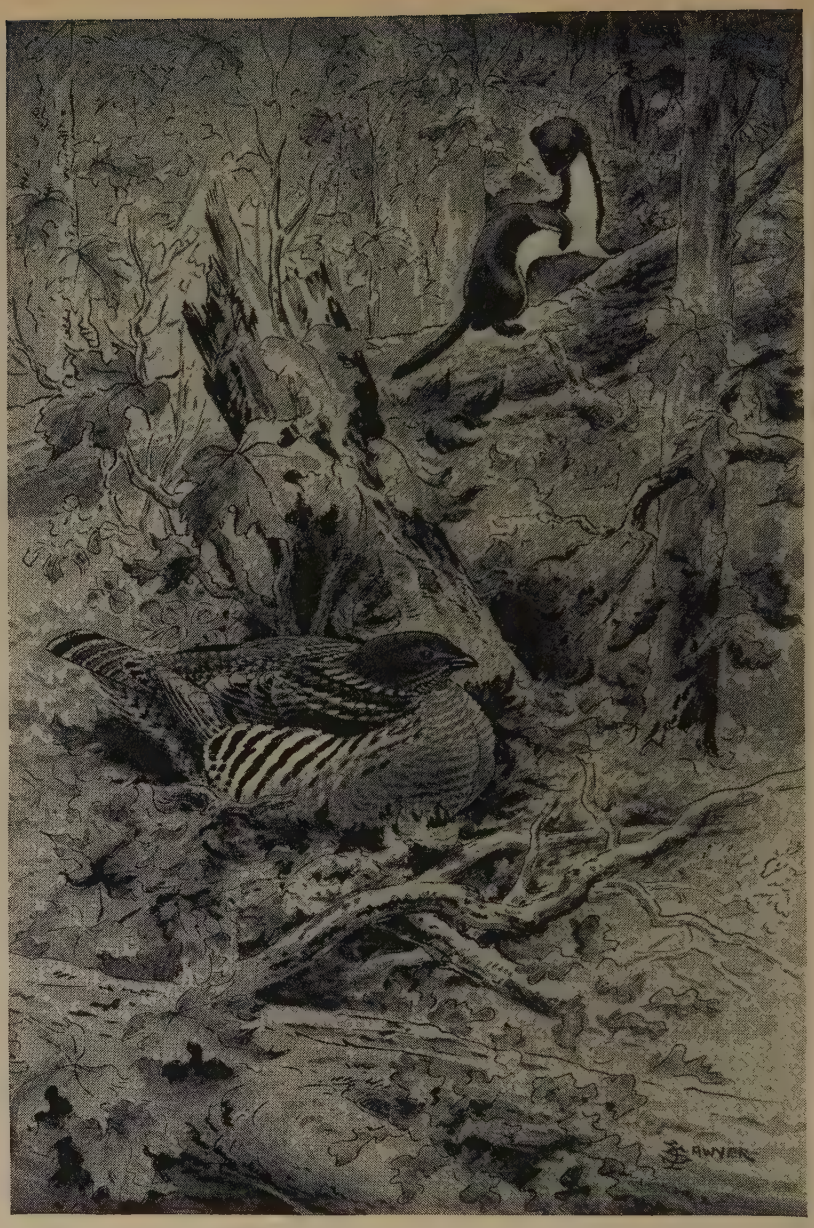
In this article Mr. Sawyer, an able and widely-informed naturalist, dips into a subject that is perennially a source of argument or discussion. Where do instinct and reason fit in the lives of animals? What in animal behavior is thought-controlled? Or is it? Readers will undoubtedly differ with the author; or agree with him most heartily. Whichever may be the case, this article does serve to emphasize the fascinations of Nature, and its study.

Wild animals share many human emotions but to us it is still—

Nature—the Unknown

By EDMUND J. SAWYER

Illustrated by the Author



THE SETTING FOR A TRAGEDY OF THE WILD THAT HUMANS LATER MAY SEEK TO RECONSTRUCT AND INTERPRET.

WILD animals share a great many, perhaps, in some degree, nearly all of our human emotions. Although we may advance theories and prejudices about "instinct" or "sense-reaction", or other such conceptions to explain the psychology of the wild, if we observe long and closely the behavior of the higher forms of wildlife we find those theories and prejudices in need of much modification. At best we can defend them after making many exceptions. Surely no field naturalist is at heart so "scientific" as to be dead to the broad human appeal of animals-as-they-are. To account for the peculiarly irresistible attraction of wildlife to the true devotee even he must look for something beyond theories; something beyond what is miscalled a "devotion to science". We must recognize something more than anatomy, descent or physical relationship. There are also satisfactions and trials, joys and sorrows, elation and dejection, pleasure, pain, content, grief, hope and despair. Such experiences by our wild neighbors, above all else, give us a feeling of close, fascinating and convincing kinship.

With that frank admission, both sincere and sympathetic, let us consider the ever-popular tendency to "dress up" and "humanize" animal life far beyond any defense, except that of drama and romance. Many of us vividly recall the heights—or depths—attained by a certain school of writers at the time Theodore Roosevelt and John Burroughs attacked "Nature-fakers". Yet some people still clamor for stories of animals that mend their broken bones with superhuman cunning and surgical skill, or discriminate with an apothecary's knowledge between poisonous and non-poisonous. They want animals that think, reason, calculate and deduct. The demand for this sort of thing still keeps some inventive brains and feverish pens profitably employed.

Much has been written to suggest that wounded mammals and birds rather commonly resort to highly intellectual methods for recovery. Even the legend about birds poisoning their hopelessly captive young still crops up. The credulous should consider that such superlative parent birds are never reported to do other things outside the routine of their species. If that were not enough for me—which it is—I should draw on my own experiences with

THE GROSBEAK LINGERED A MOMENT, THEN TOOK WING.

young birds caged, placed outdoors and fed there by their parents. This care has always continued until it came to its normal end with arrival of the self-feeding age of the young, or parental preparations for the next brood.

Following a storm, I found two young waxwings, wet and chilled, amid the wreckage of their nest. In the warmth of my nearby tent, the young birds were soon dry and calling for food. I had observed their parents feeding them almost exclusively on choke cherries, so the fledglings were soon induced to take choke cherries from my fingers. The day following their mishap I placed the cage on the ground outside my tent. Almost immediately the old waxwings were close beside the cage, regularly feeding the young through the bars. Only some ten days out of their eggs when first caged, they seemed content from the first day of their rescue and developed steadily in size and plumage.

A GROUSE ROSE WITH A STARTLING WHIRR OF WINGS.

After a few days the visits of the parents became infrequent and irregular, then ceased entirely. I took over, gathering some choke cherries, which the young birds would greedily take from my fingers, one by one. Called away for a day, I placed a quantity of fresh choke cherries in the waxwings' cage. Returning eight or ten hours later, I found the young clamoring for food. Their entire supply of cherries was exactly as I had left it. It was plain that a cherry meant nothing to them unless proffered in a parent's bill or between the fingers of their foster parent. Then and then only was it food. Had these young waxwings starved in the midst of plenty, imagination might have called it a clear case of poisoning by their parents.

As for the much-exploited "intelligence" displayed by wounded mammals and birds, my half-century of studious observation can supply no support. In no instance have I found anything but a single instinct, and that an extremely simple one. As every shooter, particularly of winged game, must have observed many times, the badly crippled bird will at once hide, or attempt to hide. Once at rest it will remain motionless until it either dies, quite recovers, or an enemy, whether predator or human being, further disturbs it.

In Wisconsin a female pintail duck fell with a broken wing fully a hundred feet into open water. With only the forepart of its head above the surface, it swam straight to the nearest point on shore. There it completely and instantly disappeared, and was found after search exactly where it had evidently first pushed its head into the overhanging grass. On another occasion, in thick cover in New York State, a ruffed grouse hurtled to the ground at a shot as if instantly killed. It appeared to have been swallowed by the earth. A long search disclosed no trace of the bird, and I had given up when, from the very spot I had crossed and recrossed, a grouse rose with a startling whirr of wings and in full vigor.

In cases of such violent injury—and their number is legion—do the birds find certain medicinal berries or herbs? Some would have us believe they frequently do. But I say, "No". Yet no one knows what, if anything, goes on in the bird's head, or nervous system, to account for any part of its actions during such experiences. Yet notwithstanding all the colorful accounts animals' broken bones can and do knit and return to their former usefulness through resort to nothing more or less than *doing nothing.*

The most baffling and exceptional case I have known of recovery in a wild thing was that of a male pine grosbeak. The bird's wing had been broken by a boy's slingshot. My efforts to splice the bone or to bind the wing against the body failed completely, and I was obliged to just let Nature take her course. Having hastily improvised a cage and placed seeds and water in it, I despairingly saw the captive huddle in a corner, one bloody, completely fractured wing dangling terribly, hopelessly. I had recently undergone the ordeal of amputating the broken wing of a pet red-poll and this experience was scarcely a spur to further surgery.

From previous experiences I had formed the crude rule that a bird that will eat is a bird that will live. Before the second or the third day had passed I saw the grosbeak pick

THE PINE GROSBEAK, WITH ITS BROKEN WING, FOLLOWED AN INSTINCT TO REMAIN QUIET.

up and eat seed after seed. It was weeks before the captive would attempt more than a few experimental hops from his corner. Soon after that he became quite animated, frequently called in a cheery way, and began to take food from my hand. He showed a special fondness for apple-seeds and I ate enough apples to keep the doctor away for many a month.

Spring came and I took the cage to our back yard and opened its door. The late captive perched on my finger a while and looked about. Suddenly he *flew*, first to a nearby tree and soon after to the very top of a large sugar maple in the next street. There I left him calling, calling and calling again for his companions who had long departed for their more northern home.

No surgical work or medical attention from any source was required to mend that grosbeak's compound fracture—no splints, no mud cast—nothing but an instinct in the wounded bird to remain quiet. True, I provided the bird with food and gave it sanctuary from possible foes, otherwise it probably would have fallen a victim to some cat or dog, or some natural enemy. This, indeed, must be the fate of many birds and mammals that suffer broken bones. It is equally probable that many others are not discovered by their enemies and eventually recover.

TWO YOUNG WAXWINGS WERE RESCUED AFTER A STORM HAD WRECKED THEIR NEST.

As for the ability of these cripples to remain in the wild state without food sufficiently long for bones to mend, it is well established that birds can go many days without food and be none the worse. John Burroughs, dwelling on that fact, told of a domestic chicken which, after fasting for some two weeks, showed no other effect than extreme emaciation. Once released from its accidentally forced confinement, it proceeded to find food and soon regained full weight. It would seem that a wild bird must have decidedly more resistance than a form long domesticated. But we know next to nothing that is definite and conclusive as to what higher forms of wildlife can endure.

Now and then we find where a fox has killed and eaten a duck; where a badger has evidently captured a ground squirrel; a trail in the snow left by a mink or a weasel who has killed and dragged away a grouse. We are inclined to make much of such occasional discoveries; to reconstruct the scenes and make what seem to us shrewd and significant deductions. Then "the prosecution rests" and "we, the jurors" render our decision, usually without hearing the defense; usually without any material witness. To a great but unknown extent the deeds of wild animals can no more reasonably be lumped and generalized than our own. Consider the scores of mammal and bird species to whom killing greater or lesser prey is "all in a day's work". Wolves, coyotes, bob-cats, skunks, owls, eagles and hawks form an army that is ever alert, pursuing, slaying and devouring by night and by day. And what do we know in detail and definitely, from direct observation of all this? Very little indeed—almost nothing. Our so-called knowledge, mostly a matter of inferences, is based on a fraction of one-tenth of one per cent of what is constantly going on in this great unending battle for life all about us.

Neither "instinct" nor "reason" seem proper synonyms for wildlife psychology. But wild animal behavior provides abundant proof of instinct, and also frequent appearances of a degree of thought. It is a mistake, however—a mistake typical of our human point of view—to suppose that instinct is necessarily inferior to thought and reason. Anyone may see in the wild cases of unquestionable and sheer instinct accomplishing *marvels*. They are marvels because they are beyond what thought and reason—even human thought and reason—could attain. And why should an animal think and reason when instinct will do the job even better? Also, not infrequently, I see in wildlife what I can explain only as the result of memory—memory as we know it. And does not such memory imply thought? That far, at least, it seems possible to go, but what a short step it is along the path to Aesop, who, be it remembered, called his writings "fables."

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We have asked our readers whether they would find an index to the second ten years of Nature Magazine sufficiently valuable to pay $1.00 or, if necessary, $1.50 for it. Many have responded favorably but not nearly enough to warrant the considerable expense involved in its preparation and publication. If you would want such an index drop us a note or post card indicating your interest.

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time; add one hour for War Time.

How to Know the Brightest Stars

By ISABEL M. LEWIS

IN THE entire heavens there are more than a billion stars which, through long photographic exposure, may have their light recorded on photographic plates attached to the most powerful telescopes. An Astrographic Catalog, planned originally in 1887, was to contain the positions of several million stars on some 44,000 photographic plates, and the work was to be accomplished through the cooperation of eighteen observatories. This catalog was far along toward completion a few years ago. There are also catalogs of stars down to the tenth magnitude, giving positions of more than half a million stars. Of all these stars there are only about one hundred and fifty that bear names, as distinguished from catalog numbers, and they are with few exceptions stars of the first, second or third magnitude, a star of each magnitude being about two and one-half times brighter than the star of next higher magnitude. A first magnitude star is one hundred times brighter than a sixth magnitude star, which is about the faintest that can be seen with the naked eye.

There are, in the heavens as a whole, between six and seven thousand stars that are visible without the aid of a telescope. Only about three thousand of these are above the horizon at one time and place. Moonlight will blot out many of these; so will haze near the horizon.

Of importance far out of proportion to their numbers are the fifty or sixty stars known as navigational stars. They are scattered throughout the heavens in both the northern and southern hemispheres. In these days an acquaintance with these stars, or at least a considerable number of them, is a necessity if one is to navigate sea or air in safety. Although nautical and air almanacs give the positions and other data concerning these vitally important stars, one should be able to pick them out at sight whenever and wherever they are visible. In addition one should

know and be able to recognize, at any time, the bright planets Mercury, Venus, Mars, Jupiter and Saturn.

On this list of fifty or sixty stars there are twenty stars of the first magnitude, or brighter. In addition, there are others associated with them in distinctive configurations, and so easily identifiable that no one should fail to recognize them whenever visible.

An exceptionally conspicuous star is usually identified by its color; its distinctive position in the constellation to which it belongs; its position relative to a near-by constellation or bright star, or by its association with a group of faint stars with which it forms an easily-identified configuration. For example, Vega, in the constellation of Lyra, forms a distinctive little equal-sided triangle with two faint stars. This star may also be identified by its remarkable diamond-like bluish-white color. It passes almost through the zenith of Washington, D.C., and all places in the same latitude. Another bright star with a distinctive grouping is Capella, in Auriga, of almost the same brightness as Vega but a golden yellow in color. Close to Capella, and to the southwest of it, is the little group of faint stars known as The Kids. Aldebaran, in Taurus, is, of course, easily located because it is in the V of The Hyades. Its deep red color also leaves no doubt of its identity. Betelgeuze, or Betelgeux, in Orion, is not far from Capella, or Aldebaran. Also reddish and irregularly variable in brightness, it lies in the northeast corner of the great quadrilateral of bright stars in Orion, in the center of which lie three bright stars in the Belt of Orion. Diagonally across from Betelgeuze, in the southwest corner of Orion, lies Rigel, brighter than Betelgeuze and a brilliant bluish-white. This constellation, generally rated as the finest in the heavens, lies over the earth's equator. The star farthest west and north in the belt lies directly on the celestial equator. It is thus visible equally well in the northern and southern hemispheres. These four stars are visible in the evening skies from late fall to early spring.

Sirius, brightest of all stars, is a brilliant white and is found by extending the line through the three stars in the Belt of Orion in a southeasterly direction. All of our familiar constellations of the northern hemisphere appear upside down in the southern hemisphere. Orion stands on his head as seen from a place south of the equator, and also Gemini, The Twins, and Leo. Regulus, a white star at the end of the handle of the familiar Sickle in Leo, forms, with Pollux in Gemini and Procyon in Canis Minor, a huge equilateral triangle. Procyon also forms, with Betelgeuze, in Orion, and Sirius, a similar triangle. Procyon and Pollux are, respectively, yellowish-white and deep yellow. The second magnitude star Castor in Gemini also forms with Pollux the familiar pair which characterizes this constellation. Castor is the farther north and less brilliant star and is white.

Canopus, in the constellation of Argo Navis, is the second brightest star in the heavens. A magnificent white star, it lies more than thirty degrees due south of Sirius in a solitary position far from other stars of first magnitude or brighter. In the latitude of Capetown, Sydney and Melbourne it crosses the meridian high overhead and is a magnificent object in the summer evening skies of the southern hemisphere. Achernar, another brilliant bluish-white star of the southern hemisphere, lies also far from other stars of first magnitude. It marks the end of the Sky-River, Eridanus, a long line of faint stars extending from a point close to Rigel, in Orion, far into the southern hemisphere. A few degrees farther south than Canopus, it is not visible north of about 32½ degrees north latitude. It crosses the meridian at nearly the same time as Mirach, the middle star in the line of three stars that mark the constellation of Andromeda, conspicuous in the evening sky of October, a spring month in the southern hemisphere.

A group of brilliant stars that everyone should know is the famed Southern Cross, or Crux. This constellation passes through the zenith in 60 degrees south latitude and is not visible, as a whole, north of about 27½ north latitude. In size it is about as large as Corvus, the small group that lies southwest of Spica, the blue-white first magnitude star at the bottom of the scrawly Y in Virgo. Crux lies about 40 degrees due south of Corvus and crosses the meridian at the same time in the evening, which is about nine P.M. the middle of May. When Crux crosses the meridian its upright points nearly due north and south so it makes a fine timepiece. Acrux, its brightest star, is blue-white and of first magnitude. It is at the southern end of the upright. At the northern end—almost exactly six degrees north—is Gamma Crucis, a star about one and one-half magnitude, while the crossarm is marked by a third magnitude star, Delta Crucis, on the west, and Beta Crucis of one and one-half magnitude on the east. The extent of the crossarm is about eight degrees. The Southern Cross could fit nicely, therefore, inside of the bowl of the Big Dipper.

The two stars Alpha and Beta Centauri, which form a pair in the southern hemisphere similar to Castor and Pollux of the northern hemisphere, lie a few degrees due east of Crux and serve as excellent Pointers to the Cross, just as Dubhe and Merak, The Pointers of the Big Dipper, point to the position of Polaris, the pole-star. Alpha Centauri, the farther east of the two stars, is known also as Rigil Kentaurus, and is a yellow star of brighter than standard first magnitude. It is also the nearest of all the bright stars to the earth. Beta Centauri is a brilliant blue-white star of first magnitude and the two form a magnificent pair. They cross the meridian at the same time as the orange-hued Arcturus, which lies at the base of the kite-shaped constellation of Bootes in the northern hemisphere and which is equal in brightness to Capella and Vega. Deneb, or Arided, another star of first magnitude, lies at the head of the Northern Cross in Cygnus, a few degrees northeast of Vega.

Three stars of our score or so of first magnitude stars we have not yet mentioned. Altair, in Aquila, is a white star, flanked on either side by a much fainter star, and located a few degrees south of the Northern Cross. Fomalhaut is a white star of the southern hemisphere in the constellation of the Southern Fish, which is visible for a brief time in the fall in mid-latitudes of the northern hemisphere. Antares, in Scorpio, is a red star (Continued on page 440)

An example of double-barrelled harmony for a decade—

Nip and Tuck Carry on

A FEW weeks ago a short, "filler" article came to the editor's desk from Helen Waterman of El Centro, California. It was entitled "Two-headed Turtle", and was accompanied by a picture of Grace Olive Wiley, noted West Coast herpetologist whose work was described in NATURE MAGAZINE for October, 1941. She was holding this turtle "double feature". The story said that the turtle was named "Nip and Tuck".

This struck a spark in the editorial memory. Checking back we found that, on Page 166 of NATURE MAGAZINE for March, 1932, there appeared a short article with the title "Nip and Tuck". It was written by S. M. Cederstrom of the University of Minnesota.

A youngster strolling along the shore of Lake Minnetonka had found a quarter-ounce, two-headed turtle soon after it had hatched. For a quarter he sold it to a passerby, who took it to the Zoology Department of the University. There it was identified as an ordinary hard-shelled snapping turtle of the species *Chelydra serpentina*. But its ordinary character stopped when one looked at the two well-formed heads.

1932

1942

Then about as big as a half-dollar, the turtle was X-rayed. It was found that each neck had the usual number of vertebrae and that each lateral half of the animal had an independent digestive tract that merged at the large intestine. Feeding it (or them) proved difficult, so they (or it) were turned over to Miss Wiley at the Museum of Natural History of the Minneapolis Public Library. She was then raising several other turtles and seemed to "have a way" with reptiles. She still has.

On the back of the 1932 picture of "Nip and Tuck" we find the following message: "Dr. Cederstrom: I know that you will be delighted to learn that your pets are living. They are much stronger and give promise of a future. They have not fed voluntarily as yet, but I believe they will before long. Sincerely, Grace Wiley."

They did feed, through one mouth or the other, either alternately, or, at times, coordinately. In his 1932 story of "Nip and Tuck" Dr. Cederstrom wrote: "It appears as if the movements of each side of the body are regulated or controlled by the brain on that side of the body. This is especially evident when each head spies food and strives to get it at the same time."

The turtle had been in captivity for a year when Dr. Cederstrom wrote about it. It had gained steadily in size and weight and was living up to the promise of a future that Miss Wiley saw for it.

When Miss Wiley went to California the turtle went with her. "Nip and Tuck" prospered and are (or is) now believed to be notable as the oldest living two-headed animal.

Although oddities in Nature—departures from the usual—are interesting, their chief value consists in attracting attention to birds, mammals, reptiles, insects and other forms. The normal in Nature is just as interesting—often more interesting—as the abnormal. The snapping turtle is no exception. It is found all over the eastern half of the United States from southeastern Canada into eastern Mexico and parts of Central America to Ecuador. Fossil remains show that it has inhabited the eastern seaboard since Pleistocene times.

The snapper is quick and powerful when placed on the defensive, and a big one can take off a finger; even a hand. Its diet is almost entirely carnivorous in Nature, although in captivity it will accept a partially vegetable fare. Its value to man is chiefly as food and as a scavenger, although it is known to catch and eat water birds, particularly the young aquatic species.

THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Schools, Gardens and the Fall

Few outlines of study for Nature or Science in the elementary grades omit consideration of garden studies in the fall months. There was a time when most of the Nature work was carried on in school gardens, and in the last World War school activities chiefly involved the maintaining of war gardens as evidence of interest in the national effort.

In spite of the fact that we now emphasize war gardens less than we did in the last war, they may exert a real influence in these days. This article, and the insert in this number of *Nature Magazine,* are not concerned with the role war gardens may play in filling our stomachs. Rather, we wish to remember that, in times like these, we must do something to defend the "finer side of life," to find beauty and peace somewhere, to have an outlet for emotions that otherwise do not find opportunity for expression.

There is no need to gush about the beauties of a garden. But there *is* need for some wholesome outlet for good in our personalities to counteract opposite influences in these times of stress. We read of the boom in "swing," booze and vice in the vicinity of our great war manufacturing plants and by no stretch of the imagination can these be considered as of value in maintaining an efficient personnel behind the lines. The movie *Mrs. Miniver* plays up beautifully how interest in rose culture served to unite people of all classes in England in time of bombing, and if we were to choose between developing a Mrs. Miniver rose or improving our acquaintance with a juke girl during "time off" there is not the slightest doubt about which would be more worth while.

With the help of the insert, schools could make a beginning by mapping the world with garden flowers. Let children bring their collections to school. Then with the help of the insert and other sources of information see which flowers came from the countries now identified with the Axis and which with the Allies. It should be obvious that some of our most beautiful flowers come from countries whose inhabitants we are forced to more or less despise because of the acts of their leaders. We cannot have a permanent peace in a world soon to be the responsibility of children now in our classes unless we learn to recognize and respect whatever is good in the worst of our enemies. This does not mean for a minute that we would recognize any obligation to forgive those responsible for the present situation, but there is great danger in mass blind hatreds if we are seeking world peace.

Our magazines are full of articles showing how residents of "occupied territories" are suffering greatly from malnutrition. While few of us believe that this country is likely to be occupied by the enemy in the immediate future, no one can question the possibility that many of our home town boys may find themselves prisoners in foreign lands within the next year. It may be that should they recognize the nutritional value of some of the weeds of our flower garden this might mean survival in place of starvation. Dandelions and some of our wild mustards are higher in vitamin A than the better advertised asparagus and canned pineapple. Yet we pull these weeds from our flower gardens and throw them away with such other plants as some of the pigweeds, sorrels and pussley, which also have considerable food value. There can be no conceivable loss and much potential gain in activities directed towards a better understanding of the nutritive value of common flower garden weeds.

As is shown in the insert, some of our fall garden flowers have medicinal value. Minnesota, Iowa and some other mid-West states have been doing much to encourage the growth in America of those plants that have medicinal value, but that have been raised commercially only in parts of the world now closed to us by war. It may be too late now to expect our fall flower garden this year to be a source of medicines, but we can lay our plans this year to see to it that next year we do not fail to do our part in making our gardens not only beautiful but practical. Our newspapers and radio have played up tremendously our dependence on the Malay Peninsula for rubber, and have pointed out the fact that that source of supply is closed to us until the Japanese have been defeated. They have failed to mention with equal emphasis our dependence upon certain occupied parts of the world for many important medicinal plants that could be grown here more easily than could rubber. A good standard dictionary will be most useful in suggesting the source of many medicines that have their origins in plants.

School children should begin to develop confidence in their own ability to learn from Nature in the raw. A fall flower garden might be a good laboratory for this sort of thing. Which of the plants to be found there have leaves or stems capable of producing fiber of reasonable quality? Do not look in any book for an answer to this question. Start experimenting to see which, if any, in your garden have any possibilities in this direction. Anyone who has pulled weeds or broken plant tops in the fall in a garden will have some judgment as to which species offer the most promise. Remember that some plant fibers are freed in a useful form only after the plant tissues have rotted to a certain degree. Do the plants in your flower garden vary in their strength as they die with the advancing winter?

The effect of frost on a fall flower garden suggests all sorts of interesting school activities. The first frost is likely to be highly selective, to pick out certain plants and destroy them while leaving others unaffected. It is likely to affect certain parts of any plant and leave other parts uninjured. Some plants may be stimulated to open their flowers or fruits by a visit from the frost. Others may cease flowering when the frost comes, and still others may make spectacular color changes. All of these things have some significance to the alert Nature teacher who has a flower garden as a source of supply.

The coming of frost to a flower garden usually means that it is time to dig some of the species whose natural home is in the warmer parts of the world. Cannas, gladiolas and the like possibly do not grow wild in the northern parts of our continent because they cannot survive the winters. The fact that we have to dig these plants may then serve as a clue to their origin. Check on this idea to see how it holds with the species to be found in your flower garden this fall.

When it comes time to dig these fall garden flowers, we have some excellent opportunities to see not only what has happened to our plants underground but also to see what their associates have been doing. Earthworms, slugs, pill-bugs, beetles and their larvae, and a host of other small creatures may be making their adjustments to the coming severe season, and some may have sought shelter in the underground parts of our garden flowers. The question now arises as to whether we should separate them from the plants or leave them in the earth about the stored plant parts until next spring. We may feel it is better to leave our canna roots packed in earth until spring so that they may not dry out so severely, but if we protect this earth from hard freezing we also protect in it some creatures that may be pests. Flower gardens constantly offer us new problems and call for new decisions foreign from the decisions we may have to make otherwise. This makes them really refreshing. An understanding of these problems by children should be useful to them, particularly if their future is tied in any sense with the prosperity of plants dependent on them for success.

Of course the artist sees in a flower garden much that the gardener may overlook, but the gardener also sees much that has no significance to the artist. The artist in us must stand back now and then each fall and look over our garden to decide how it might be made to look better another year. In the fall, we see not only the effects of our earlier efforts, but have an opportunity to decide how next year's garden may be better than the one we raised this year. We may not be able to contribute appreciably to making the whole world a better place in which to live, but every one of us can make our flower garden next year a better one. We can do it without interfering in the least with our contribution to the war effort, and in our garden we and our pupils can find opportunity to labor for something that is aimed at making the world a better and a more beautiful place without first having to destroy other human beings. There is not the slightest doubt but that destruction of our enemies is essential to our ultimate happiness in these days, but if we are to save our souls we must on occasion help make something beautiful and a garden is worth every effort we may put on it if that is our goal.

●

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REDISCOVERED WOOD

(Continued from page 405)

This quantity must be compared with a yearly world output of not quite 1500 million tons of coal, 300 million tons of mineral oils, less than 500 million tons of wheat, corn, and potatoes, not quite 200 million tons of metals.

This means that the world's potential yearly supply of the raw material wood represents more than twice the present world production of all mineral and vegetable raw materials, including textiles and milk. It also means that the world's forests are a permanent renewable fund placing yearly three tons of raw material at the disposal of every human being living on the earth. From this fund known and tested technical processes can provide humanity with housing, vehicles, heat, power, clothes, instruction, food, and an unlimited number of plastics, drugs, accessories, and conveniences.

These developments are of course bound to affect profoundly the world's forest situation. Since the new uses of wood do not depend on the size of the trees, it will become unnecessary to grow forests for 100 years or longer. Forests will be cut when the trees reach their highest rate of growth, which is usually the case after thirty to fifty years, according to species and climate. This will increase considerably the average commercial yield per acre of forest land. For this increased yield there will be an ever-widening market, since wood will be used and looked upon as a truly raw material.

Forestry will thus become more profitable, returns will be comparable to other branches of agricultural or mineral raw material production. The forest owner will find an economic advantage in maintaining and expanding his yearly supply of raw materials, and the reduced reproduction period will make everybody grasp the fact that forests are a crop, the yield of which can be raised by intensified management.

Of course, these changes will not take place suddenly nor will they apply completely. Improved outlets for low-grade woods depend on the capacity of new wood-using industries, which can only be built up gradually. It will certainly take a long time before the 1,000,000,000 tons of present fuelwood production and wood waste, and the additional 4,500,000,000 tons of wood that can be made available, will have found a permanent industrial market. So far they constitute rather a potential reserve than a definite supply.

Nor will all forest plantations be cut after thirty or fifty years of growth. In certain selected forests the practice of growing large timbers and of cultivating high-grade specimens will be continued, just as the mass production of ready-made men's suits has not stopped the manufacture of tailored suits made to order.

Nevertheless, new, voluntarily-adopted forest practices based on technical developments and justified by sound economic reasoning seem to bring the answer and final solution to the much-debated problem of forest conservation. This is not another case of wishful thinking, or of promising the advent of the Golden Age. Although the new industrial trends and uses are only beginning to make themselves felt in different parts of the world, they have already induced American forest industries to engage in a program of sound forest management. All over the country tree farms are being started by the industry. Systematic reforestation and sustained yield cutting are rapidly replacing older, more devastating practices.

The new raw material conceptions being developed for wood are not confined to that one raw material. Metals, oil, rubber and coal products have been treated as raw materials in the modern sense of that term for a long time. Decomposed mechanically or chemically, blended and processed, they are shaped to suit the purposes for which they are intended. Lately all kinds of vegetable crops—wheat textiles, even air and water—have been taken to the test tube and turned into products that have nothing to do with their original and traditional uses or forms. Magnesium is produced from sea water; ladies' hats from milk; plastics from coffee.

The machine age, which started at the time of America's Declaration of Independence, has created a new world with unprecedented problems. Multiplying many hundred times the world's output of commodities, the machine soon had exhausted the traditional sources of raw material supply. Nevertheless, these raw materials continued to be thought of in their traditional forms, and when locally available supplies became insufficient to feed the industrial machine, the same raw materials were imported from distant territories. As a result, the industrial countries became dependent on raw material supplies from other parts of the world. The access to raw materials and their control was the crucial problem in world politics. In the absence of raw material shortages, England would not be faced with almost insuperable difficulties in Egypt or India; nor would Japan be induced to grab Manchuria and China as a co-prosperity zone; nor would Europe and Germany have been driven to the misery and despair that set the scene for Hitler and the terrors of Fascism. Therefore, the Atlantic Charter has promised "free access for all to all raw materials" as one of the fundamental peace aims of the United Nations.

Now, however, a new, or at least a complementary solution, seems to be developing. Instead of bringing traditional raw materials from abroad, why not complete the existing supplies by means of other national available raw materials that can serve the same purpose?

Perhaps the day is near when all raw materials will be looked upon as a pool, containing certain quantities of various basic substances such as carbohydrates, minerals, fats, and the like, irrespective of the original form in which these substances happen to be available. This would still leave plenty of room for international trade, but exchanges over great distances would be confined to specialties, whereas every country would be first supplied with basic raw materials from its own raw material pool. At the same time the production of commodities would only be limited by the capacity of existing machinery or by distribution problems. Nowhere in the world would raw material shortages stand in the way of higher living standards. The unlimited supply of raw material would rather become an immediate stimulus for increased production.

Forest products are more versatile than any other material. The world's potential wood supply is larger in quantity than all other raw materials taken together. Forests are an ever-renewable crop. In the raw material economy of tomorrow forests are likely to be called upon to occupy a central position.

The enormous forest resources of the United States and of the Western Hemisphere reserve once again a dominant role to this continent. Yet, since it is characteristic of forests that they can be found almost anywhere, America's forest wealth is not a basis for a future monopoly or international control, but another opportunity for America's engineering genius and spirit of enterprise to lead the world on the path of further progress.

BRIGHTEST STARS

(Continued from page 436)

easily identified as the brightest star in this magnificent constellation of the zodiac, which never appears far above our southern horizon, but rides high overhead in the latitudes of Sydney, Capetown and Buenos Aires. All of these stars, and more than thirty more of second magnitude, are the widely-scattered sky-pilots of both hemispheres, vitally important in guiding our navigators of sea and air.

The planet Mercury will be too close to the sun to be seen this month until a week or so before it reaches greatest western elongation in the morning sky on October 26. On that date it will rise less than two hours before the sun, and will continue to be visible on successive mornings for the remainder of the month. Venus will be close to the sun in the morning sky and difficult to observe this month. Mars also will be too close to the sun in the morning sky to be seen in October. Jupiter is now a magnificent object in the morning sky in Gemini. Saturn is now in Taurus and is visible most of the night, rising about two hours after sunset the middle of the month. It lies a few degrees northeast of Aldebaran and is as brilliant as Vega and pale yellow in color.

Parks Magazine

A welcome newcomer to the ranks of conservation publications is the *National Parks Magazine,* official publication of the National Parks Association. This quarterly succeeds the former bulletin published by the Association and is edited by Devereux Butcher, who is also executive secretary, taking the place of Edward B. Ballard now an officer in the Army Air Forces. The first issue of the new publication includes an editoral estimate of the importance of national parks in wartime by William P. Wharton; an article entitled "Half a Century and the National Parks" by Newton B. Drury, Director of the National Park Service; a feature on "The World's First Picture Galleries" by Ethel W. Musgrave and an appeal for preservation of the Singer Wildlife Refuge, now threatened by lumbering.

Correspond and Exchange

Mrs. Maude Hearn Lund of Baie de Wasai, Michigan, would like to correspond and exchange specimens with others interested in butterflies and moths, wild flower seeds, native tree leaves, rocks and minerals and ferns.

BATTLE OF BAMBI

Raymond J. Brown, Editor of *Outdoor Life,* has put on the hair shirt in behalf of American gunners and roundly condemns Walt Disney's film *Bambi* as "the worst insult ever offered in any form to American sportsmen and conservationists." Such an exaggerated statement is typical of the ridiculous misrepresentation of the contents of the film in Mr. Brown's polemic in his September issue. In fact, by its very intemperance, this attack stamps itself as more advertising and circulation propaganda than reasoned appraisal of the picture, even from the gunner's point of view.

The objections voiced by Mr. Brown center in the fact that Bambi is orphaned as a fawn when his mother is shot in the spring. "We are quite certain," writes Editor Brown, "that nobody who happens to read these lines ever heard of an American sportsman shooting a doe on the first day of spring." Certainly, we agree, no man remotely entitled to the name of "sportsman" would be guilty of such an inhumane act. But the mere possession of a gun does not make Man a sportsman. In fact, Mr. Brown seems to believe that the eight million licensed hunters are all sportsmen and conservationists.

Actually the minority has any real notion of what wildlife conservation is all about, and the majority still gripes at restrictions designed to keep game birds and mammals from extirpation.

Explaining the stir in the forest, Bambi's mother tells her fawn that "Man is in the forest." Just Man—not a member of the Blackbury Rod and Gun Club or the Whiteburg Conservation League. Man is the enemy of wildlife in *Bambi,* and if he is not in fact, who is, we would like to know. Mr. Brown will answer that we should look at the refuges that have been created for wild game; at the bag limits and hunting seasons that have been established. Certainly, he will plead, this reflects a solicitude for wildlife. Of course it does, and for one major reason—so that that wildlife may be shot. However you may dress it up, and however much you may adorn the gunner with the halo of wildlife conservation, it is still Man who pulls the trigger.

It is still Man who continues to shoot various species of game birds although they are moving steadily toward the fate of the passenger pigeon.

Mr. Brown objects to the forest fire sequence as another reflection on the sportsman—just why we cannot understand. Certainly Man is the major cause of forest fires, largely through carelessness, and, in some parts of the country, by design.

Mr. Brown also objects to a scene showing Bambi's doe, Faline, pursued by a pack of savage dogs. Yet on page 28 of Mr. Brown's September issue is a story extolling the sporting joys of hunting bear with dogs. A subtitle of the article reads: "The call of distant hounds, running behind a bear, is sweet music to the ears of Virginia's mountain people." Other articles and stories in the same magazine glorify a deer hunt (in season, of course); analyze the hitting power of hand guns; sell the merits of sharptail grouse as a target.

All of which is proper editorial content for Mr. Brown's audience, but painfully inconsistent with his attack on the motion picture.

Outdoor Life is "a journal for the dissemination of trade and technical information to the sporting-goods industry and to the sportsmen." As such it has an axe to grind and every right to grind it—thank God—in this free country of ours.

We have seen the film, which is more than can be said for no few rod and gun editors who have rushed into print on Mr. Brown's say-so. And, having seen *Bambi,* we do not believe that any real sportsman or conservationist will regard himself as the prototype of the invisible man in *Bambi.* As for the rest, we do not care what they think.

—R. W. W.

Ape Buddies

My Friends, The Apes. By Belle J. Benchley. Boston. 1942. Little, Brown and Company. 296 pages. Illustrated. $3.00.

Belle Benchley is the only woman director of a zoo, having started as a bookkeeper and become director of the Zoological Gardens of San Diego. Recently the fascinating story of her zoo work appeared in *My Life in a Man-Made Jungle.* In this book she dealt, necessarily too briefly, with the apes that are outstanding residents of her "man-made jungle." This set the stage for the current volume in which Mrs. Benchley is able to tell, in more and fascinating detail, of her anthropoid charges, including the nationally known gorillas, Mbongo and Ngagi. Mrs. Benchley writes with an informal charm and reveals a deep understanding and affection for the animals whose diets she so carefully watches and about whose welfare she constantly worries. When the late Martin Johnson visited San Diego, after he had turned the two gorillas over to the zoo, he told Mrs. Benchley that he disliked zoos but that after seeing the way in which the animals were cared for in San Diego he felt that they had found a real home. This book reveals why.

Illinois Reptiles

A Key to the Reptiles and Amphibians of Illinois. By Fred R. Cagle. Carbondale, Ill. 1942. Museum of Natural and Social Sciences. 38 pages. Illustrated. $.25.

This pamphlet by the director of the museum and professor of zoology at Southern Illinois Normal University is published in the hope that it will stimulate additional interest in the herpetological fauna of the state.

The title is descriptive of the object and contents of the booklet, which is a very practical and usable guide. A bibliography and glossary add to its value.

Astronomy

Essentials of Astronomy. By John Charles Duncan. New York. 1942. Harper and Brothers. 181 pages. Illustrated. $1.85.

Here is a simple and non-technical introduction to astronomy and a knowledge of the universe. It is a book that would be immensely valuable to anyone starting a study of the heavens. The text is direct and contains the minimum scientific terminology necessary. Eight pages of star maps and about one hundred other illustrations add much to the value of the book.

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RECENT SARGENT PUBLICATIONS

EDUCATION IN WARTIME, pub. June, 1942, 224 pp., red silk cloth, $1.50. Reviews educational thought, publications and doings of the year. Tells what's doing in schools and colleges in this time of change, what war has done and what will win. Finds educators unprepared and lacking in pertinent information. Redefines education and looks for hope to the inspiring individual rather than to isms and systems.

HANDBOOK OF PRIVATE SCHOOLS, pub. May, 1942, 26th ed., 1152 pp., 250 illustrations, 17 maps, $6.00. An Annual Review and Guide Book for all interested in private initiative in education. Individual private schools critically described.

A GUIDE TO SCHOOLS, COLLEGES AND CAMPS, pub. April, 1942, 7th ed., 232 pp., paper cover, 50c. A Guide for prospective students to colleges, junior colleges, private schools and summer camps.

WAR AND EDUCATION: TRENDS AND TENDENCIES TODAY, for early Fall publication, ca. 350 pp., cloth, $3.50. Appraises changes resulting from the war. Presents evidence that our education leaves us without understanding and without emotional control—that our current systems of education make possible our present systems of wars.

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NATURE IN PRINT

As a convenience to readers the books reviewed in the pages of Nature Magazine may be ordered through the book department of the American Nature Association, 1214 16th St., Washington, D. C.

(Continued from page 426)

too can view them with reasoning hopes. I know that at present the only way to slight this interest is constantly to stir other interests, and for this reason I am particularly thankful for *The Seashore Parade* and *Horns and Antlers* in my home. The former is for the younger child readers and the latter for older boys and girls, yet it seems worth mentioning that each is interesting as well as informative for both my too-young son and his too-old father. Both "readers", also, I believe, profit from the fact that these books do divert attention from the war—the father because of a recreational relief that if often repeated should strengthen any citizen for the strains of a total war; the son because of the expelling influences of an interest that is more significant to him.

Readers of this magazine who may participate in the plans for Children's Book Week next November—with their local schools, libraries, book-stores, churches, Boy Scouts, Girl Scouts, Campfire Girls, Parent-Teacher Associations, and other groups—will do their children and the cause of Nature Education a good turn, I believe, if they can successfully promote such books as *The Seashore Parade* and *Horns and Antlers* for childhood reading. "Timely books" are not always best for the times, but good books are always timely.

How reassuring Alan Devoe's book entitled *Lives Around Us* was to me, after these thoughts regarding Children's Book Week had thus been reduced to writing, can well be apprehended by those who have already read his accounts of rural living in *Phudd Hill* and particularly his series of contemplative descriptions in *Down to Earth.* More vivid than before, to a reader of *Lives Around Us,* is the earlier perception that in Alan Devoe this generation has a natural philosopher to whom attention is due, an observer whose works are so engagingly written that attention is easy.

Reflections on avoiding disillusionment for the child in guiding his wartime reading—given expression before receipt of *Lives Around Us*—are revived by Mr. Devoe's plain statement: "It is a fact of the outdoors . . . that a major occupation of all creatures of earth is the killing of other kinds of creatures. . . . To have life is to have hunger; to sustain life is to require the sacrifice of other lives." Yet also one's conclusions regarding the importance of what Mr. Devoe calls "venerable stabilities" are confirmed. "Bewildered as we look at the havoc man has made of man's particular world, we may come to know a certain peace," he says, "and to take firm hold upon a certain changeless rock, by quitting now and then the contemplation of the merely human scene and entering into that larger contemplation which shall include not simply the contemporary antics of our wayward species but also the life-ways of batrachian and insect, reptile and leaf-mouthed plant."

More beautifully elsewhere he reminds his readers that the "cumulus clouds still sail high in the sky, unmoved from their course by the thunder of cannon . . . the wind still blows and calms in its customary fashion, the maples still thrust their taproots into the earth and raise their leaves to the sun, the hairless larva caterpillar still metamorphoses by its ancient alchemy into an eye-winged moth."

Yet, as in *Down to Earth,* these statements of philosophy are only the keynote, or background, paragraphs for a calendar's sequence of essays that are rich in narrative and description—illustrated too by exquisitely appropriate woodcuts by Frank Utpatel. Thoroughly mature in its approaches, *Lives Around Us* is—because of these animal tales—not inappropriate even in subject matter in a discussion of children and books. Older boys and girls will certainly find it profitably intriguing, and it may have other values in the home, too, for childhood reading is probably no more important than childhood listening and it is a considerable advantage, I find, to have one's store of knowledge and anecdote enriched by good reading for stories to tell to children.

Inescapable, however, is the implication that if the thoughts of children can profitably be directed away from war, so also should the contemplation of adults be relieved to some degree from its perplexities and essential animosities. Perhaps, then, not only unembittered young men and women but also their unblinded elders can participate in reconstructing human associations with conscious safeguards against malice. Such associations would promote the sort of world toward which Mr. Devoe is surely pointing when he directs attention as he does in *Lives Around Us.*

"It is very hard for the individual spirit to maintain unshifted its orientation, and to keep a strong core of inward security, and to know unchangeably with a strong sureness the things that it must know." This Mr. Devoe admits, but he adds: "I think that simply by watching with perceptive vision and honest hearts the commonest earth-happenings of everyday . . . it is possible to reassure ourselves of certain changeless things, and to re-find a core of permanence in the shifting apparency of our contemporary world." I believe that he is right.

Haven in the Jungle

Jungle Haven. By Albert Leeds Stillman. Philadelphia. 1942. The John C. Winston Company. 321 pages. Illustrated by Henry C. Pitz. $2.00.

Time being at a premium, we must admit that it is not always possible to read every word of every book that we review. However, we got started on *Jungle Haven* and read it from start to finish, and at the expense of other things that needed doing. This is fiction, the story of a boy who spent many years studying, particularly in the field of science, then was caught up in a revolution in a fictitious Balkan kingdom and was charged with the safety of the two young princes of the realm. Fleeing with them from the machinations of the agents of "Power B", he winds up in the upper Amazon jungle. The three are waylaid by Indians, drugged, stripped and left to die. Starting from scratch, Bob Mexican builds for himself and his two royal charges a self-sufficient existence, culminating with the manufacture of a crystal radio set. The result is a book that is a sort of modern and scientific *Robinson Crusoe.* Although the author's style is here and there a bit stilted, and Bob Mexican's inexhaustible resource a little incredible—if you stop to think about it—the story has great intrinsic value in showing how man can live with and by Nature. This would be a splendid book for young people over the age of twelve but it is not restricted to a youthful audience. If dad gets to it first junior is likely to have to wait his chance. —R. W. W.

If You Are Bombed

How to Camp Out if You Are Bombed. By Ellsworth Jaeger. Buffalo, N. Y. 1942. Buffalo Museum of Science. 41 pages. $.50.

This is a mimeographed publication bringing between covers the material presented in a special course conducted by the author for the training of leaders, guides and instructors in what might be described as "outdoor competence." The information in this publication is, of course, valuable for outdoor activity under peace-time conditions, as well as in the event of emergency camping forced by air attacks. Mr. Jaeger has assembled and selected pertinent information and supports the text with helpful illustrations. Getting along in the outdoors should not be too difficult if we are forced to it.

Succulents

Succulent Plants of New and Old World Deserts. By E. J. Alexander. New York. 1942. The New York Botanical Garden. 64 pages. Illustrated. Fifty cents.

The title of this booklet is descriptive of its contents, which will be heartily welcomed by enthusiasts for this group of plants. The booklet covers the cactuses of America; South African and other Old World succulents; century plants and other New World dwellers, and includes directions for home culture. There are illustrations of one hundred of the 350 species treated.

The Maine Trail

Guide to the Appalachian Trail in Maine. Washington, D. C. 1942. Maine Appalachian Trail Club. 600 pages. 13 maps. $2.50.

This is the fourth and revised edition of this splendid guide. Four new maps have been added. The publication is in looseleaf form so that maps may be removed and used, while needed, in a map case and then returned to the book, or so that the section required for a particular trip may be separated from the rest of the volume. The book is, of course, a "must" for any one who hikes in Maine. It is sold by the Appalachian Trail Conference, 808 17th Street, N. W., Washington, D. C.

Eating Outdoors

Come and Get It! By George W. Martin. New York. 1942. A. S. Barnes and Company. 189 pages. $2.00.

The subtitle of this book is "The Compleat Outdoor Chef". It deals with outdoor cookery and eating, from the preparation of a meal on the rustic fireplace in the backyard to a more pretentious barbecue affair. The book is full of practical directions and recipes and covers all the items on the outdoor menu from meats to desserts. It will be useful to any outdoor person.

CAMERA TRAILS

(Continued from page 395)

the sky is likely to bring is sure to be fun to do and of wide interest when it is done.

There are ten chief classes of clouds in the international weather language, and during the course of a year you can almost certainly shoot all of them right at home. Indeed, the set of pictures will be even more thrilling if they all show the same foreground. The pictures will be quite different since the types appear on days when light varies so widely, but the photographic technique is similar for all of them.

The problem is simpler than trying to get thrilling clouds on the film along with detail in the comparatively dark foreground, and you can get along without a filter, although using one will show the details in the clouds better and make them stand out more vividly against the sky. Without a filter it is only necessary to give one-half to one-eighth of the usual exposure for a scene under that same sky, and the exposure will be about half as great with a filter as you would ordinarily give for that scene without one. The reduced exposure makes the sky darker and adds contrast between the light areas in the clouds themselves.

Using Verichrome, or Plenachrome, or a panchromatic film of their sensitivity, the cloud exposure on a clear day with cumulus formations in the sky might be 1/200th at f/11, or 1/100th second at f/16, with no filter. Twice as much would be ample for a medium yellow, but the same as those figures would usually give about what you want.

So keep the idea in the back of your mind and shoot whatever types of clouds present themselves. When you have them finished, you can get expert advice as to their classification and, by that time, you will have learned what weather they foretell.

MOCKINGBIRDS AND OWL

By JOHN M. MCBRYDE

As the mockingbird is a rugged individualist, the male constantly scrapping not only with squirrels, dogs, and cats, and other birds, but with members of his own species, I was not a little surprised to discover, on the first of June, about sixty-five or seventy mockingbirds on the ground in Audubon Park, New Orleans, within a space of about a hundred square feet. They were feeding together, running along lifting their wings above their bodies or occasionally leaping into the air, all apparently having a good time. There were no sparring encounters such as in the late fall and early spring, when the males begin to establish territory for their nests. On the contrary, it looked like a great picnic, including males and females, old and young, members of the various families in the neighborhood, with no lines drawn.

A far more individual and unsocial bird is the owl, and yet to my surprise I have noted for two or three years a male barred owl that comes into a thickly-populated residential district and, in spite of the protests and attacks of the jays, mockingbirds, cardinals, and others, spends the summer in the same section, roosting in the top of the trees and disturbing the sleep of the people in the neighborhood with his unearthly hoots. Then in September or October he retires to the swamps to rear his brood. I have often wondered what could bring this shy denizen of swamp or forest to the crowded, noisy city. The only explanation I can imagine is that he is attracted by the rats, numbers of which I have seen in the night running along the electric light wires, and in the day also. If this is the true reason for his coming, we should welcome him to the city, especially as he does not feed on chickens, and we should steel ourselves to endure the disturbing effect of his uncanny halloos.

ANIMAL DISCIPLINE

By CARL J. E. NELSON

I have received much pleasure from befriending the so-called dumb animals. Often I have found them not to be so dumb after all. They can teach man important lessons and often put him to shame.

In my first pastorate, New Windsor, Illinois, I tamed a common gopher by giving it a daily ration of corn. The gopher decided to make my front yard its home and burrowed into the ground for a specific purpose, which I later discovered. One day my pet gopher surprised me by introducing her baby. Later, she found it necessary to leave her baby at home. I watched with interest the little fellow's refusal to stay alone. He tagged after his mother and she chased him back time and again. She had said "no" and meant it. Some mothers will say "no", then yield and let the child have its own way. Not so with mother gopher. When she had driven her baby back several times and it still persisted, she waited by the hole. When baby gopher's head appeared she bounced on him and gave him a walloping. When he finally disappeared in the hole she took further precaution. There was a stone, about the size of a baseball, a little way from the hole, and mother gopher rolled it over the hole and closed the door of her home. It served a two-fold purpose. It kept her baby in and intruders out. I watched her leave after she had closed the door. She did not stop to look around and see if her effort was a success.

I wondered what would happen if she had to return in a hurry with a pursuer after her, but I did not see her when she came home. Later the stone had been rolled away and mother and babe appeared daily afterwards.

Biology and Society

Levels of Integration in Biological and Social Systems. Edited by Robert Redfield. Lancaster, Pa. 1942. The Jaques Cattell Press. 240 pages. $2.50.

This is the seventh volume in a series devoted to current symposia in the field of biology. It is a collection of papers delivered at a symposium held at the University of Chicago at the celebration of the fiftieth anniversary of the University. It presents a series of papers that relate the more primitive societies, from the protozoans on up, with man's society. This is a book for the thoughtful student of the facts and philosophy of existence and its interrelationships. After an excellent analytical introduction by Dr. Redfield, in which he maps the integration of the several papers, one proceeds from a discussion of the transition from the unicellular to the multicellular individual to papers on the societies of primitive man and on modern society.

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STORM OVER PEYOTE

(Continued from page 412)

tions during a dreamy state. As the Indians put it, peyote makes you "love everybody." Equally as often, however, users experience a feeling of excitement and nervousness during the rite, with depression the following day. A characteristic report is that of a Kiowan in Oklahoma, who describes the effects of peyote on him vividly: "When you first eat mescal, it sets your body all trembling, in a little while the body is so tired . . . it blurs the eyes . . . in a short time one is nervous, can't sit still, can't rest . . . then one becomes dizzy and he vomits . . . then the man is so weak he does not wish to move or raise his head . . . in the morning just before sunrise, you feel like one who has passed through some fearful thing. Then there comes a happy feeling, you think that you are saved from that fearful thing."

Of the morally degrading effects of peyote, the witness of the missionaries is insistent, supported by the statements of intelligent leaders of Indian communities. Few cases have come to the attention of medical authorities in the Indian Service and the Public Health Service. One case in Nevada of an Indian who had become maniacal after continued use of peyote over a period of months is on the district court record.

Well-informed Indians like Eugene Standing Elk, a Cheyenne leader in his community, are opposed to the use of peyote, branding it as "false and deceitful in its effects." It is probably true to say that the exhilarating or depressing, the pleasant or frightening effects of the drug depend upon the basic personality of the user. Furthermore, studies will probably prove it more accurate to say that peyote exerts a *hedonistic* habituation where the user wishes to experience over and over again the exotic sensations produced.

What is this drug considered by some a representative of the Deity and by others the "devil's root"? Botanists are united now in believing that the cactus *Lophophora williamsii,* commonly called peyote, is not to be confused with other plants that may bear the similar common name, peyote. For example, it should not be confused with the ancient Aztec drug Teononacatl, the narcotic mushroom of the Aztecs. It bears no resemblance, botanically, to the hemp plant, *Cannabis americana,* a variety of the *Cannabis indica,* from which hashish or marihuana is prepared. The plant with which we deal in this article has numerous names. It has been called mescal button, mescal, dry whiskey, white mule, Indian dope, and devil's root—a name given it by the old Spanish priest, Father Ortego, in the days of the Spanish conquistadores.

The final answer as to whether peyote is habit-forming, insanity-producing, and morally degrading is yet to be given. At the time of the establishment of the United States Narcotic Farms by Congress in 1929, peyote along with marihuana was included under the term of "habit-forming narcotic drug" and within ten years eleven western states had enacted statutes prohibiting its use in their jurisdictions. More potent than marihuana in its narcotic effects, almost as widespread as morphine and its derivative, the lowly cactus seems destined to raise problems of religious and medical significance far beyond the dreams of its ancient Aztec users.

The precise action of peyote on the body and nervous system of man has not yet been studied carefully. Numerous experimenters with mescaline, the alkaloid found in peyote, have described mental changes and bodily perception changes closely akin to those of serious mental diseases such as schizophrenia. From a purely medical point of view there is nothing in peyote to recommend its use for any known medical disease. The Surgeon-General of the United States stated quite wisely that peyote ought not to be administered as a remedy in medicine without adequate knowledge of its effects and consequence. At this stage of the controversy one thing is certain, that the use of peyote to dull the pain of an aching abdomen, to quiet the cough of tuberculosis, to obliterate symptoms of undiagnosed disease is harmful and representative of a retrogression of American scientific medicine. Whether the American Indian, perhaps discouraged with the struggle to attain the social status of his white brethren, chooses to remain in his tipi curing ills through consumption of peyote, or to adjust himself to civilization and science, is a question for the future to decide.

CHILDREN OF THE SUN

(Continued from page 429)

upon a black field cricket in the midst of one of its final serenades. It stood on the edge of a brown leaf, which curled up behind it like a miniature bandstand, projecting the sound of its instrumental solo out into space. The little musician's tail was down and its wings were raised and moving as it produced its creaking chirps.

Close by the leaf was a female. She caught sight of me as I approached along the path and scurried away. Oblivious to her departure, the dusky musician played on. In the chill of late afternoon, his wings rasped together slowly. The vivacity and alertness of summer days were gone. A full minute passed after the departure of the female before the dulled perceptions of the serenader realized that his audience had fled. Then he saw me. He darted off, jumping this way and that among the fallen leaves, in abrupt and headlong flight.

These latter days of autumn, recording the gradual descent of the mercury, bring a slowing down of insect activity. The tide has turned and is flowing out for these creatures of the sun. Changes in warmth—changes that achieve such varied magic as controlling the appearance of male aphids, governing the length of a cockroach generation, regulating the speed of a running ant, changing the tempo of the snowy tree cricket's music, telling butterflies and grasshoppers and bees when to take to the air—these variations reach their most sweeping importance with the coming of fall.

DOVES

By JOEL W. HEDGPETH

There will be a mourning dove season in the western states again this fall, although doves were so scarce last year in some districts that hunters were obliged to stay afield all day in order to bag their limit.

It does not seem to occur to such hunters that a species has reached that dangerous point beyond which its numbers can never return when it takes them a whole day to shoot the limit. But they must have the limit, since they believe it is their right to bag all the law allows by virtue of their purchase of a license, and the investment in guns, dogs and travelling expenses.

Doves, however, cannot understand the niceties of bag limits, which are too often the result of compromises between the conservative recommendations of biologists supported by license funds and the state legislators grinding axes for their sporting friends. All the doves can do is try to dodge the birdshot.

Perhaps the dove is a dainty tidbit for the table (it does seem somewhat barbarous even to discuss eating one), but most sportsmen seem to enjoy hamburger as well as venison, and chicken as well as dove, and in advancing such a claim are merely evading their real reason for wishing to kill doves. Of course they would feel a bit foolish bringing home one limp dove, so they must be allowed a dozen to make a fine show with the dog and the gun, but it is time for them to stop their pious talk of table delicacies, and admit that it is just as much sport to go out and shoot crows.

In some ways our hunters seem to be more sentimental than the conservationists and women's clubs, for they are still trying to pretend that this country is still the great wild land of open spaces, and that they are the true torchbearers of that frontier tradition. Tomorrow there may be no more doves, and only the hardiest will be able to find anything to shoot at in the remotest fastnesses. But today the hunt must go on.

As long as they fail to realise that tomorrow does come, and in fact is here already, and that today is the time they should decrease bag limits, so long as they reap like grasshoppers the animals they hunt will decrease to the vanishing point. Perhaps it is true that doves are difficult targets, with changes of speed that make them hard to hit, but so are those clay gadgets that some use in skeet matches.

And there must be many mighty hunters who feel at least apologetic when they return wearily from the field with their fouled guns, and a handful of limp dead doves.

O PIONEERS!

By RALPH R. DAVIS

The publication of a recent dragonfly paper in *Entomological News* for December, 1941, proves that there is a lot of pioneering yet to be done in unexpected places. Ranger-naturalist Ahrens of Acadia National Park netted twenty-five previously unlisted species of dragonflies on Mount Desert Island, Maine, during July and August of 1940 and 1941. Mount Desert, with its well-known Bar Harbor, has been a rendezvous of scientists for years. It is one of the oldest summer resorts in America. The entomologist Dr. William Proctor has a famous laboratory there. His annotated lists of the species of the animal kingdom run into volumes.

When I spent the summer of 1939 at Bar Harbor, I had planned to work on the dragonflies of the area, but when I saw Dr. Proctor's list, I decided the work was done. His list, after years of collecting, totaled 54 species. In two short summers, Ranger-naturalist Ahrens changed that list from 54 to 80 species collected in his spare time . . . and ranger-naturalists work six 14-hour days each week!

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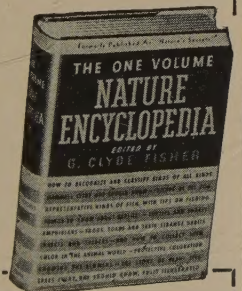

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WILD HUNTERS

By NAT C. HUNNICUTT

Man's civilization is often wearisome, but life in the wilderness is full of thrills. I shall not forget a gray winter day, and a certain quail hunt, in southern Arkansas. I was a boy, then, who after tramping hours through abandoned fields and the forest had stopped in the late afternoon to rest by a blackjack oak on a leaf-covered hill, near the usual corn patch. Woodchoppers had been busy, and piles of brush lay here and there.

A penetrating kind of cry—the quail's peculiar word for *hawk*—reached my ears. A second or two later a large covey of these beautiful birds came flying rapidly about me, to seek the protection of a particularly large pile of this brush, quite near. No attention was paid me. They simply entered shelter with projectile-like speed. The tiger of their lives was attacking. And I had seen such behavior many times.

But now they certainly had need of hurry. For the barest instant passed, from the moment of their covering, until a hawk (of the kind known locally as "hen-hawk", and looking much like the pictured goshawk of the dictionary) flew with the silence of shadow to a perch on a blasted tree in front of my position.

And there he sat, quiet and still, and watchful as a man, searching every nook and cranny of the ground beneath him—as if he knew all to be known of quail, their habits, and their extremity. I hugged my tree and waited without motion, sensing the imminence of tragedy.

Perhaps three minutes passed, during which the grim hunter was static as stone, eyes bleak as death, watching and listening, fiercely determined. But nothing occurred. And I was ready to make myself known by shooting Mr. Goshawk, when a very astonishing thing took place.

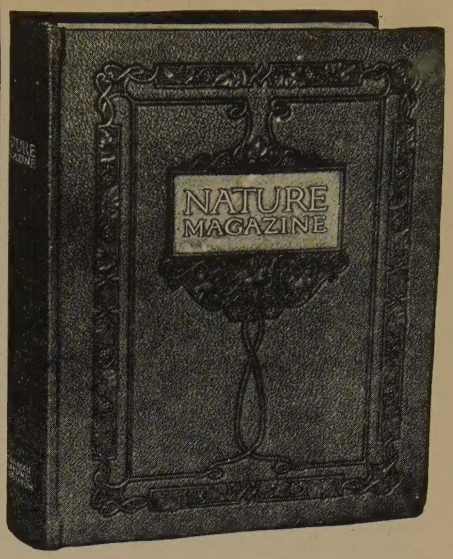
Glancing down the hill toward the corn field, I was truly amazed to see another great hawk—doubtless the first one's mate—advancing up the slope, walking on the ground, and beating the ankle-deep leaves with tremendous strokes of its long wings.

Just as a man might have done, it came, straight toward its mate on the blasted tree. It beat a sizable path through the covert, flailing the earth, and zig-zagging its course (with a series of quick steps and hops), through the scattered brush.

I had not recovered from wonder at this remarkable example of reasonable action on the part of a "dumb brute" before that action forced quick and dramatic results. A single quail, outflown by his comrades, had found refuge under a small bush in the path of this rapacious seeker. And now, in the face of his enemy's terrifying approach, the little prey could not continue his concealment. He left the hiding place like a bullet, expending every energy to reach the large brush pile that covered his companions. Probably he would have been successful, too, but for the wily watcher on the blasted tree. My heart turned suddenly sick.

For no sooner had the tiny, scurrying victim begun his swift and thrumming flight than the ruthless monster from above fell on him, like the proverbial thunderbolt.

A savage, incredibly ferocious movement. A pitiful small strangled scream—as I sat inactive—and then, two dark shadows of destruction went flying away, together, through the deepening dusk.



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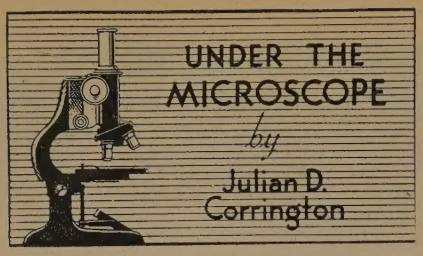


DIOPTRICS

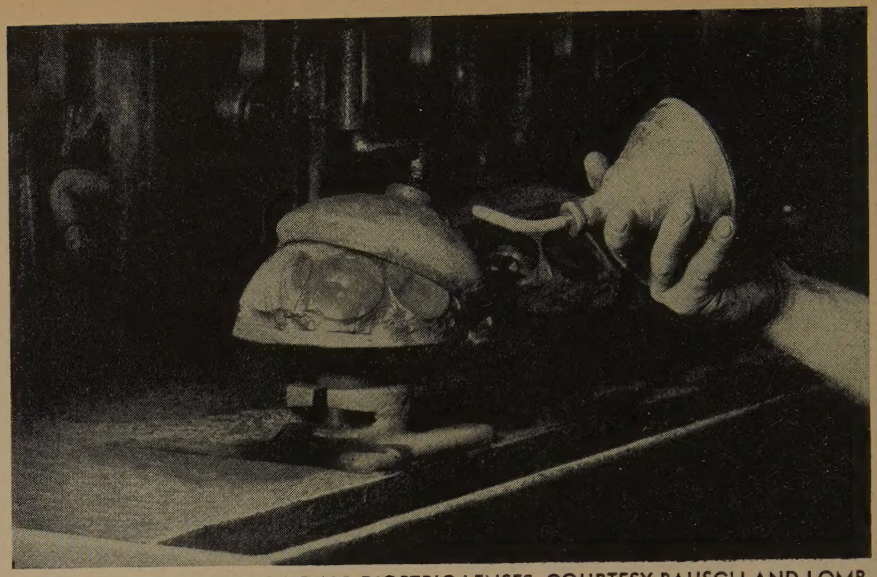
In the optical trade both the manufacturer and prescriber of spectacles require some convenient system for designating the strength of their lenses. Magnifying power is unsuitable, not only because all powers used for this purpose are very small as compared with those of compound microscopes and telescopes, but also because the amount of enlargement obtained with any lens depends on the image distance, which may be varied. In order to standardize expressions of magnification, most manufacturers agreed on an arbitrary image distance of 10 inches or 250 mm., being that distance at which the average person holds an object away from the eye in order to inspect detail. Magnification is a function of the focal length (f) of a lens when referred to this image distance, and may be calculated by the formula: magnification $=$ $\frac{\text{image distance}}{\text{focal distance}} + 1$; or $M = \frac{d}{f} + 1$. In the case of a lens whose focal distance is 20 mm., the magnifying power is $\frac{250}{20} + 1 = 13.5X$.

For spectacle lenses and also, to a less extent, for all simple magnifiers, projection lenses and amplifiers, and a few other cases, the unit for designating the many kinds is the diopter (D), also written dioptre or dioptry by some authors. Camera manufacturers use focal length (f), but opticians prefer the reciprocal of f and call this the focal power of a lens. By reciprocal is meant the quotient of unity divided by any quantity. Thus, when the focal length of a lens is expressed in meters, the reciprocal gives the focal power in diopters; or $\frac{1}{f} = D$. In the previous example, with a lens whose focal distance is 20 mm., divide 1 by this figure expressed in meters: $\frac{1}{.02} = 50D$. Conversely, given a lens with a known strength of 50 diopters, the focal length is found as the reciprocal: $\frac{1}{D} = f$, or $\frac{1}{50} = .02$ m, or 20 mm. Reciprocals are such that their product is always equal to unity: thus $\frac{1}{50} \times \frac{1}{.02} = \frac{1}{1} = 1$, or distance x power $= 1$. Another way of putting the same principle is to say that the focal power of a lens varies inversely with its focal length, and vice versa.

Diopter is taken from the Greek for *through* and *to see;* dioptrics is a division of the science of optics that deals with refraction of light by lenses, but in this form the word has largely been replaced by refraction, just as the older term catoptrics has been supplanted by reflection.

A diopter is a refracting power equal to that of a lens whose focal distance is one meter. Employed as a unit, it designates a function that various writers describe as power, focal power, strength, or optical strength of a lens, and it is obvious that when power is used in this sense it must not be confused with magnification, which is also commonly referred to as power.

A biconvex or other form of converging lens is said to have positive power, a biconcave or other form of diverging lens negative power. Hence diopters are stated as plus or minus. A converging lens with a focal distance of 500 mm. (½m.) has a power of $\frac{1}{0.5} = +2$ diopters; a diverging lens with a focal distance of 250 mm. (¼m.) has a power of $\frac{1}{0.25} = -4$ D. The glass disks placed before your eyes when you are having them tested are dioptric lenses. Positive ones are used to correct hyperopia (far-sightedness) and negative ones to correct myopia (near-sightedness).



AUTOMATIC MACHINE GRINDING DIOPTRIC LENSES. COURTESY BAUSCH AND LOMB.

TECHNIQUE NOTES

While molds are best studied in the living state and as water mounts, every general microscopist will wish to prepare mycelium showing sporangia and, in a second slide, zygospores, as stained and permanent additions to the slide collection. A rough-and-ready technique involving almost any fixer and stain may be used, but for first-class whole mounts specialists in filamentous algae and fungi have found certain procedures will yield consistently superior results.

Much preferred today is the *hygrobutol technique,* so we shall use *Rhizopus* as the means of introducing this new process to our readers. To begin with, mycelium is obtained by exposing bread for one day, then placing the slice on a tumbler inverted in a shallow dish of water, the whole capped by a bell jar or similar inverted container. By this means the bread is kept out of the water, but in an atmosphere saturated with moisture. However, to maintain the species, once secured, the original mycelium should be cultured by one of the approved modern methods, and whether or not the individual microscopist is interested in keeping a colony going, we recommend that he perform the steps here given in order to learn culturing procedure.

One of the difficulties, in the case of bread molds, is to grow mycelium on a rich nutrient medium and yet be able to lift it off readily for mounting, without tearing. Since the mass is very delicate, the problem was not easily solved, ordinary agar being too solid and firm at room temperatures to permit such manipulation. Most laboratories now obtain a pure culture by the use of potato broth. Prepare this medium by cleaning, peeling, and slicing one or more Irish potatoes and boiling for one hour in distilled water of three times the volume of potato (3 cc. water to each gram of potato); strain through cheesecloth and add distilled water to make up to the original quantity; that is, to replace the water lost during boiling. Place in a flask—the technician calls this "flasking" the broth—and sterilize as for work with bacteria (this Department, January, 1940). Prunes may be used instead of potato.

To two-thirds of this broth add sugar (ration card coupon #8, please) and agar at the rate of 2 g. sugar and 3 g. agar for each 100 cc. broth, and boil for 30 minutes in a double boiler, then strain, flask, and sterilize. Pour this mixture into petri dishes, each one-half full, and allow to solidify, then add from the remaining third of broth enough to cap each agar plate to a depth of one to two mm. The dishes are now inoculated by transferring mycelium from bread or sprinkling sporangiospores on the fluid from a single sporangium of a known species. By picking up such materials under the microscope from *Rhizopus nigricans* growing on a piece of bread, one avoids including other species of molds. Plus and minus strains, once determined, are similarly subcultured and perpetuated, taking care to keep them separate except when zygospore formation is wanted.

Warmth and moisture are essential for a vigorous growth, but room temperature is usually adequate, the average strain thriving best at 30° C. When sporangia are well developed, any desired amount of the mold may be lifted bodily from the petri dish and transferred to another petri or to a flat stender, crystallizing dish, or other suitable wide and flat container for further work. In all subsequent operations it will be best to remove the old reagent and add the new by using a large pipette, allowing the material to remain undisturbed in its vessel. Too much handling is not good for delicate subjects.

Fix for two days in formalin-acetic-alcohol modified by doubling the proportion of formalin: 10 cc. commercial formalin, 5 cc. glacial acetic acid, 90 cc. 50% ethyl alcohol. Wash out well with water after fixation. Stain

HARRIS' HEMATOXYLIN

Especially fine for staining whole mounts'

Hematoxylin, crystals	5 g.
Aluminum ammonium sulphate	3 g.
Alcohol, ethyl, 50%	1,000 cc.

Dissolve the hematoxylin and alum in the alcohol by heating, then add 6 g. mercuric oxide, which must be the red powder, and boil for 30 minutes. Filter and add 50% alcohol to bring the whole up to the original volume. Add one drop HCl to each 100 cc. of the stain. This is one of the most successful methods for immediate ripening of alum hematoxylin. It is ready to use as soon as cool.

for one hour or until well overstained in Harris' hematoxylin, then differentiate with a weak (e.g., 1/10%) HCl destain until the nuclei are blue-black and still somewhat overstained. Agitate the vessel by gentle rocking to insure equal differentiation throughout. Examine a bit of the material under the microscope from time to time and check the destaining, when proper, by thorough washing in tap water.

By the method of Johansen, the mold is now subjected to 15, 30, 50 and 70% alcohols, 30 minutes each, to 85% alcohol for overnight, then into a mixture of equal parts of 95% alcohol and methyl cellosolve containing 1% fast green as a counterstain for 15 minutes. If somewhat overstained, do not differentiate at this time as the following steps will extract some of the dye.

Pipette off the counterstain and wash out excess with 95% alcohol. Replace with fresh 95% alcohol and at once begin the addition of hygrobutol by the method of gradual substitution, done by adding a small amount every 30 seconds, to avoid diffusion currents. Mix by tilting the container, and pour off some of the fluid after every fourth addition. Continue until the proportions are about nine parts hygrobutol to one of alcohol. Pour off most of this mixture and replace at once with balsam which has been diluted ten times with hygrobutol. Use a copious quantity of this diluted balsam, seeing that all parts of the specimen are well immersed.

Place the vessel in a warm, dust-free situation for evaporation of the hygrobutol, for not less than two hours, until of proper consistency for mounting. Gently remove a mass of the material in balsam to a slide, but in so doing do not pull on or otherwise strain the delicate threads; rather cut them into small lengths with scissors, remembering that portions 5 mm. long will seem quite ample through a lens. Arrange with needles dipped into hygrobutol, then add sufficient additional balsam, if necessary, and a cover glass.

In a similar technique recommended by Sass, material is carried, after hematoxylin staining and subsequent washing, through 20, 35, and 50% alcohols, 30 minutes each, then to 70% alcohol to which a few drops of fast green stock solution have been added, and leave until somewhat overstained (4 to 12 hours). Rinse in 70% alcohol and proceed through the following steps at one-hour intervals: 3 parts alcohol to 1 hygrobutol; 2 to 2; 1 part alcohol to 3 hygrobutol; pure hygrobutol, changed twice at 15-minute intervals; 5% solution of balsam in hygrobutol in a short, wide-mouthed bottle; evaporate slowly at 35° C.; mount when the balsam is slightly more fluid than for ordinary slides.

Hygrobutol is a special form of tertiary butyl alcohol, prepared expressly for the dehydration of material to be mounted entire in balsam. It was described by Johansen in 1937-38, and may be obtained from the California Botanical Materials Co., 787 Melville Ave., Palo Alto, Calif.

References:

Johansen, D. A., *Plant Microtechnique*. McGraw-Hill, N. Y., 1940.

Sass, J. E., *Elements of Botanical Microtechnique*. McGraw-Hill, N. Y., 1940.

HISTORICAL OUTLINE

Thus far in the present series we have been considering such topics as evidence whether or not the ancients used any optical instruments, the invention of spectacles and of simple microscopes, invention of the compound microscope and discovery of the basic laws of optics, the first users of microscopes and what they did with these instruments, and the rise of scientific societies. Our survey has carried us to the middle of the eighteenth century.

Before continuing this story it will be well for us to pause a bit and look into the nature of the subjects that occupied the minds of thinking men in the hundred years ending around 1750. People—even the most original and brilliant among them—are bound to be influenced by thoughts current in their times; their training will follow accepted general scientific and philosophical beliefs of the period. In years of maturity, the superior thinkers will advance beyond the general level of their century, but no man can project himself wholly outside of his own era. If, then, we find that there were widely held beliefs that formed subjects of controversy and research among the scholars of the periods already covered, and that these beliefs had considerable weight in shaping the minds and the work of the leaders in science, then such matters become not only relevant but indeed essential to our historical outline.

From very ancient times there had been more or less general discussion among the thinking peoples in each succeeding generation as to the origin of the lower animals. Reproduction was not well understood, even in higher vertebrates. It is necessary to recall that sperms were not discovered until 1677, when Leeuwenhoek communicated the finding of animalcules—actually human sperm cells—and which he thought at first to be products of putrefaction. Later he went on to study the spermatozoa of many kinds of animals and concluded that these highly microscopic objects were the true agents of reproduction. Eggs were of course known for such animals as fish, frogs, turtles, and birds, in which they are so obvious, but the mammalian egg was not found until von Baer, in 1827, removed one on the tip of a knife blade from a follicle of the ovary and placed it under the microscope. The fact that these reproductive

Background for the Microscope

Equipment for the pursuit of microscopy may be as simple or as elaborate as individual inclinations dictate; but there is one item wholly indispensable —*books!* The microscope is handmaiden to all the sciences, and those who follow its adventuresome trail must have many a guide to direct along the right path.

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elements were cells was not appreciated until the neighborhood of 1860, while Hertwig, in 1875, first observed fertilization.

Thus, scientific knowledge of reproduction is considerably less than one hundred years old, and we must be prepared for some curious theories on the part of both scientist and philosopher, from Aristotle to Darwin. Two of these theories of major importance required the services of the microscope for either proof or rebuttal, and hence fall within the province of our discussions. They gave rise to two of the greatest controversies in the whole history of biological science; spontaneous generation versus biogenesis, to be discussed in part at this time, and preformation versus epigenesis, to be taken up in a later installment.

Lacking optical instruments and therefore a knowledge of cells, the ancients believed that an embryo arose through a mixture of fluids of the two sexes; the male engenders, the female nourishes, said Aristotle. The initiation of a new individual was thought of as a sort of coagulation, as the curd arises in milk. For organisms, however, in which no reproductive processes or elements had been observed, the theory of spontaneous generation had grown up from very remote times and flourished without question to the middle of the seventeenth century, struggled along in the face of scientific proof to the contrary for the next two hundred years, and only gasped its last breath as a scientific dogma as late as 1864.

Spontaneous generation was the belief that animals could arise anew from non-living matter and was really a resort to which to retreat in the absence of any evidence in each particular case. Flies were seen to emerge from manure piles, so it was assumed that the heat of decomposition enabled the necessary elements present in decaying organic matter to combine in such a way as to produce a new life. The farmer went home across his fields in the evening, seeing nothing of note, but the next morning found them teeming with tiny frogs, hence he concluded that they had rained down from the sky or had hatched from the mud and slime of an adjacent pond. Eels and even mice were supposed to crystallize out of ooze; insects from dew.

The first serious attack on this popular conception was that of Francesco Redi, in 1668, with a very modern and well-planned series of experiments. Redi placed a piece of meat within each of three jars. The first was left uncovered, the second was capped by gauze, and the third was tightly corked. Blowflies visited the first bottle and deposited eggs in the meat, as is their habit, and these subsequently hatched into maggots. The female fly, attracted by the odor but unable to reach the meat of the second jar, deposited eggs on the gauze, behaving in the purely machine-like and automatic manner of instinctive reaction so well recognized today. The eggs hatched, but the tiny maggots could not reach the decaying meat and soon perished. No maggots developed in the meat itself, and this was true likewise of the third jar, to which the adult females were not even attracted, there being no odor.

Redi went on to further studies in other insects, dissecting out the eggs of a mantis, for example, and concluded that there was no life without antecedent life. His work should have been sufficiently convincing, but there were many skeptics and die-hards who pointed to internal parasites and insects emerging from plant galls as proof of spontaneous generation. Malpighi jumped into the controversy and proved that galls are made by parent insects as a suitable environment for their eggs, and this work was furthered by Antonio Vallisnieri with publication of *Observations on the Fly of Rosebushes* in 1713. All three of the great pioneer microscopists took a stand against the popular theory; Malpighi, Swammerdam, and Leeuwenhoek all holding out for origin of new individuals solely from eggs. Leeuwenhoek proved that aphids, flies, clams, and many others of the lower animals reproduce by means of eggs, yet he was himself unwittingly instrumental in reopening the argument by his discovery of bacteria, protozoa, and other minute organisms.

Here was a new and most fertile field for the proponents of spontaneous generation; let someone try to prove to them that bacteria laid eggs! Anyone could see that if you exposed a piece of meat, encased in gauze or even corked up tightly in a bottle, it decayed and shortly was teeming with millions of microscopic beings. The only possible explanation was that these "animalcules" arose within the meat spontaneously. Or was it the only possible explanation? In our next chapter we shall see how the attack on this problem led to far-reaching results and developed two of our generation's outstanding sciences—bacteriology and parasitology.

Controversy merely for the sake of argument and concerning trifling matters is, of course, childish and to be deplored. But scientific controversy is another case entirely. As long as an existing notion is accepted by everyone and is unchallenged, no further progress is possible. But let someone attack a favored theory and many will fly to its defense. In gathering ammunition, both sides must look into the question in greater detail than ever before, and thus intensive research is fostered. As business survives through competition, so science advances through controversy; and thus the notion of spontaneous generation, ridiculed today by even the high school student of biology, played a most important part during more than two hundred years of research. From challenge of this age-old belief came the present knowledge of the nature of disease, the use of antiseptics, the preservation of foods, the cycles of parasites, and synthetic chemistry; truly an amazing brood of paramount importance.

American Society of Amateur Microscopists

President, Simon Henry Gage, Ithaca, N. Y.
Permanent Secretary, Julian D. Corrington, Chestertown, Md.
Official organ, *Nature Magazine*, Washington, D. C.
Address all communications concerning the Society to Dr. Corrington at Chestertown, Md. Application for Membership form sent on request.

FIVE YEAR CLUB

While the Society will not be five years of age until March, 1944, a peculiar combination of circumstances ushered in the fifth dues-paying period on September 1 of this year. The Charter Members paid fifty cents each, regardless of age, in 1939 and again, with later members, the same for 1940. In 1941 dues were raised to one dollar per year for adults, while remaining at fifty cents for those less than eighteen in age. This totaled three years of payments. However, also in 1941, the fiscal period was changed from a calendar year to the school year, as best fitting the interests of the majority of members, and the first such new period, being the fourth dues-year, began on September 1, 1941. Consequently, September 1, 1942 begins the fifth dues-year, which will end on August 31, 1943.

To date there are twenty-nine of the present membership of eleven hundred who have paid dues in full for these five years, constituting a Secretary's Honor Roll or Founders Club or something of the sort. The next few months should greatly increase the size of this club as dues for the new period, 1942-43, come in. At present the list includes:

R. F. Behan, San Francisco; W. Burrells, London, England; J. D. Corrington, Chestertown, Md.; J. T. Diebold, Weehawken, N. J.; L. I. Elkins, Brooklyn; C. Engels, Portland, Me.; V. E. Flanders, Syracuse; W. W. Gage, Corning, N. Y.; B. R. Irving, Berkeley, Cal.; J. A. Keji, Albany; M. E. Knebel, Lake Hughes, Cal.; M. Kornsweig, New York; C. H. Kratochvil, Racine, Wis.; B. Lea, Portland, Ore.; Dr. J. L. Leitch and Dr. M. S. Leitch, Bel Air, Md.; R. E. McKinney, Roslindale, Mass.; H. C. Messinger, Malvern, Pa.; R. C. Mitchell, Waterloo, Ia.; E. D. Nielson, Salt Lake City; C. P. O'Brien, New York; L. B. Rickards, Wheeling, W. Va.; F. J. Sadilek, Des Moines; A. M. Scott, New Orleans; J. G. Smith, Robersonville, N. C.; G. F. Stauffer, Sharon Hill, Pa.; R. L. Sweet, Trenton, N. J.; F. W. Weiler, Allentown, Pa.; and G. Weingarten, Dover, N. J.

Even this small list gives a good cross-section of the Society, embracing as it does both men and women of many different ages and professions and from all sections of the country and one abroad.

Issue No. 1 of Vol. II of the *Bulletin* is now in preparation, and promises to maintain the standard set by previous numbers. Feature articles include culturing methods for protozoa, leaf structure, paraffin imbedding device, bacterial diseases of plants, and growing pollen tubes in culture media. Leading articles are now abstracted and appear in *Biological Abstracts*, recognition of the attainments of our publication.

A large proportion of our membership is now in one of the armed services, yet maintain their interest nonetheless. A fund is being established to take care of the dues of these members for the duration, and the Secretary is now receiving applications for such aid as well as contributions for the purpose.

There being this little and rather awkward bit of space to fill, the Editor of Nature Magazine would like to take advantage of it to say that it is a rare privilege to work with a department editor whose copy is prepared with the care and competence of Dr. Corrington's. He would like, also, to express the hope that ASAM members appreciate the great contribution of time and effort Dr. Corrington has given to their organization.